Bulletin on NARCOTICS

Vol. II, No. 4, OCTOBER 1950

UNITED NATIONS

DEPARTMENT OF SOCIAL AFFAIRS

Lake Success, New York

NOTE

Reproduction of unsigned material is authorized and welcomed. For permission to reproduce signed material, request should be made to the Secretariat of the United Nations. It would, however, be appreciated, if a copy of any publication containing such material could be sent to the Secretariat of the United Nations.

Opinions expressed in signed articles are not necessarily those of organs or Members of the United Nations.

Table of Contents

Page

GENERAL

Coca chewing, geography and nutrition 2

TECHNICAL

Cannabis, by Dr. R. J. Bouquet 14

Medical aspects of addiction to analgesic drugs, by Victor H. Vogel and Harris Isbell, U.S. Public Health Service Hospital, Lexington, Ky. 31

OFFICIAL

Commission of Inquiry on the Coca Leaf 41

Methods of work 41

Conclusions and Recommendations 43

Recommendations 44

New legislation on the coca leaf 48

BIBLIOGRAPHY

Synthetic compounds having Cannabis-like activity 53

Coca Chewing, Geography and Nutrition

1. The chewing of coca leaf[1]

Coca-leaf chewing, or "coqueo" as it is called, is related to a wide diversity of factors: social, economic, biopsychological, cultural, geographical, nutritional, etc. In this paper, climate, altitude and nutrition will be considered.

It is a widely held opinion that because of these three factors coca-leaf chewing can to a great extent be regarded as a necessity in some parts of South America. The purpose of this paper is to inquire whether the generalization is correct or not.

The three closely interrelated factors are studied in the light of social, economic and cultural factors, as well as to strictly geographical and nutritional considerations, since geography and nutrition are closely related to various social, economic and cultural factors and *vice versa*.

Coca-leaf chewing occurs to a greater or lesser extent in a number of South American countries, particularly in Peru and Bolivia, followed in importance by Colombia and the north of the Argentine Republic. Coca is also chewed to a lesser extent in small areas of Brazil and Venezuela. In Ecuador, it is generally held that the habit has practically disappeared.

In the present paper, only Peru and Bolivia have been considered.

II. Geography

1. General

Before considering whether climate and altitude are determining factors in coca-leaf chewing, it is necessary to examine various geographical features of Peru and Bolivia.

[1] For a general study of coca-leaf chewing and its effects, and the possibility of restricting the production and chewing of the coca leaf, see the *Report of the United Nations Commission of Enquiry on the Coca Leaf*, document E/1666 (E/CN.7/AC.2/1). See also "Commission of Enquiry on the Coca Leaf" in the *United Nations Bulletin on Narcotics*, No. 1, October 1949, page 20.

A. *Peru*

Peru is divided into three zones: the coastal belt, the *sierra* and the *selva* or *montaña*. Approximate total area: 1,250,000 square kilometres; population: 7,023,111.

The coastal belt: The coastal belt which is 1,800 kilometres long and 80 to 120 kilometres wide varies in height from sea level to 1,750 metres. It represents 11.5 per cent of the total area of the country and contains 25.15 per cent of the total population. It is in this zone that the internal and external movement of population in Peru is greatest. Most of the migrants to the coastal belt from other parts of Peru are inhabitants of the *sierra*. The result is that, according to the 1940 census, 12 per cent of the coastal population are Natives of the *sierra*. This partly explains the existence of coca-leaf chewing in the low coastal belt but not wholly since it is practised in the coastal zone for reasons that have nothing to do with altitude or with the ethnic origin of most of the inhabitants of the *sierra*. It is for such reasons that more or less large groups of the Natives of the coastal belt also chew coca.

The following features of this zone should also be noted:

(*a*) The *mestizo* and white population outnumbers the Indian;[2]

(*b*) The urban population is greater than the rural;

(*c*) Illiteracy is less than in the *sierra;*

(*d*) It has the most important manufacturing industries in Peru.

The sierra: The altitude varies between 1,750 and 3,500 to 4,000 metres. Above this altitude is the thinly inhabited *puna*.

By its very nature the *sierra* does not constitute a unit and its topography is extremely irregular. Two facts must be noted:

(*a*) The coca-producing areas are dispersed but concentrated locally; and

(*b*) The coca-chewing areas are dispersed but concentrated locally.

The contradiction is only apparent and is due to the simultaneous effects of two sets of factors:

(*a*) Geographical: climate, water, altitude etc.; and

(*b*) Social and economic: living and working conditions, nutrition, etc.

The *sierra* occupies almost 27 per cent of the total area of Peru and contains 61.66 per cent of its population; 98.25 per cent of the population are Natives of the *sierra*. The almost total absence of internal and external migration, combined with the other factors mentioned, also explains the regional concentration of the coca-chewing population.

Because of its share of the population the *sierra* constitutes the nucleus of the population of Peru and it therefore seems logical to suppose that the harmful effects of coca chewing, which is practised in this zone to a greater extent than in the others, must have repercussions over a large part of the country.[3] Further, since Peru is a predominantly agricultural country and the *sierra* is the most important region from the agricultural point of view, it may be assumed that the harmful effects will adversely affect not only agricultural production but living conditions which are based upon it.

Other features of the *sierra* are:

(*a*) The population is predominantly Indian. Most of the Indians are Quechuas and Aymaras, the former being much more numerous than the latter. They normally live in different areas;

(*b*) The rural population is larger than the urban;

(*c*) Illiteracy is extremely high;

(*d*) Mining is of great importance in some places.

The selva or montaña: This zone occupies the greatest area of Peru—61.33 per cent—but is the most sparsely inhabited with 13.19 per cent of the total population.

Of the three zones considered, it may be said to have the greatest geographical unity. It forms part of the vast Amazon basin; 97.1 per cent of the population is indigenous. Most of the few immigrants—only 1.94 per cent of the population—come from the *sierra* and appear to be largely Indians and *mestizos*. Little coca leaf is produced or chewed. The following basic characteristics should be noted:

(*a*) The population is mainly *mestizo* and white;

(*b*) The rural population outnumbers the urban;

(*c*) Illiteracy seems in some cases to be relatively less than in the coastal zone and consequently, than in the *sierra*.

B. *Bolivia*

Bolivia is usually regarded as being divided into two major regions: the *altiplano* and the eastern zone or *llanos*. In reality, an intermediate region of irregular form and great economic importance, consisting of the valleys and *yungas*, must be distinguished.

The altiplano: This is a region similar in some respects to the *sierra* of Peru. It extends over approximately 100,000 square kilometres between the Western

[2] The 1940 census does not give separate percentages for whites and *mestizos*.

[3] For the harmful effects of coca-leaf chewing, see the *Report* referred to in footnote [1].

Cordillera and the Eastern Cordillera, or Cordillera Real. Economically, the latter is more important than the former because of its mineral wealth. The principal characteristics are:

(*a*) Average altitude 3,600 metres;

(*b*) Population predominantly Indian, the majority being Quechuas and Aymaras;

(*c*) The principal concentrations of population are found in the *altiplano,* notably in La Paz and Potosí. The rural population is substantial and consists principally of Indians and secondarily of *mestizos;*

(*d*) The principal productive activity is mining, but potatoes, quinua, barley, wheat, etc. are grown. There are areas suitable for large-scale farming, particularly in the vicinity of Lake Titicaca, and also for stock-raising. In general, it is thought that large areas of the plateau could become important agriculturally if an adequate system of irrigation were established in certain regions;[4]

(*e*) There is no coca-leaf production;

(*f*) Coca-leaf chewing, however, occurs extensively throughout the *altiplano;*

(*g*) Illiteracy is high.

Valleys and yungas.[5] These form intermediate zones between the *altiplano,* and more particularly the Cordillera Oriental, and the plains or *llanos.*

The valleys and *yungas* may be considered in three separate zones:

North: In the department of La Paz. The most important are those of Pelechuco, Camata, Tipuani, Zongo, Coroico, Coripata, Chulumani and Irupana.

Centre: In the department of Cochabamba, extending into the departments of Chuquisaca, Potosí and Santa Cruz.

South: In the departments of Chuquisaca and Tarija. The most important general characteristics of the valleys and *yungas* are:

(*a*) The population is predominantly Indian;

(*b*) The rural population outnumbers the urban;

(*c*) Illiteracy is less widespread than in the *altiplano;*

(*d*) Agriculture is the most important productive activity;

(*e*) Economically, the production of coca leaf is probably the principal source of income;

(*f*) Coca-leaf chewing is very widespread, particularly among the small farmers and labourers.

The llanos or eastern zone: This region has special features with regard to population, geography and production; the most important are:

(*a*) The population is predominantly Indian, the most important ethnic groups being the Pampeano and the Guaraní;

(*b*) The rural population outnumbers the urban;

(*c*) Illiteracy is very high;

(*d*) The main productive activity is agriculture and stock-raising;

(*e*) A small amount of coca leaf is produced in the vicinity of the city of Santa Cruz and Valle Grande;

(*f*) Coca-leaf chewing occurs to a limited extent in these areas and in the Tarija area.

2. Climate

It has frequently been stated that the extremely harsh climate of the regions where coca-leaf chewing is most prevalent is an essential factor in causing the habit.

Without denying the possible general influence of climate, as a physical factor, on the habits of men, it must be recognized that the coca-leaf is chewed in Peru and Bolivia in regions with widely differing climatic conditions. It can therefore be concluded that in any case the cold, harsh climate of the plateau regions is not a determining factor in coca-leaf chewing since the habit is found in regions with a semi-tropical climate and in others with moderate temperatures and humidity. Moreover, in the areas with severe climates, there are large groups of the population which do not chew coca leaf.

Although not an exhaustive enumeration of the places in which coca-leaf chewing is practised to a greater or lesser extent under different climatic conditions, the following list of coca-chewing areas is sufficient to support this contention:

Peru

1. The Tingo María and Quillabamba districts; both are situated in the Departments of Huánuco and Cuzco and are semi-tropical. Both are also important coca-producing areas.

2. The coastal districts of Lambeyeque and Trujillo where the climate is humid and the temperature varies between 13° and 15°C. Trujillo is also an important coca-producing area.

3. Lima, the capital and Callao, with a humid, moderate climate. Coca-leaf chewing occurs to a limited extent. They are not producing areas.

[4] The river Viscachani, Tachagua and Desaguadero schemes should be mentioned.

[5] The term "valley" is generally applied to the spurs of the Eastern Cordillera or Cordillera Real, which have a semi-tropical climate and luxuriant vegetation. The altitude is normally less than 2,000 metres. "Yungas" are lowlands with the same climate and abundant vegetation; they are normally under 1,000 metres. There is no strict demarcation between the two regions and the term "yungas" frequently has a more general meaning than merely a lowland or small valley.

4. The coastal districts of Ica (particularly Nasca), Arequipa (Chala), Tacna and the islands of San Lorenzo, where the climate is generally humid and temperate.

5. Huánuco, the capital, and its vicinity, with an intermediate but very dry climate. The department of Huánuco is the third largest coca-chewing centre and one of the principal producing areas.

6. Puno, Cuzco, Cerro de Pasco and Junin, where the temperatures are low, especially in winter. The first two are the most important coca-chewing centres. In Cuzco, where the relief is very varied, coca-leaf chewing is practised in both the highlands and the valleys: Quillabamba, Lares, Urubamba, etc., and even in areas such as Santa Isabel at lower altitude.

Bolivia

1. The semi-tropical region of the *yungas* (Coroico, Coripata, Chulumani, Huancané, Irupana etc.). These are also the most important producing centres. Mean annual temperature 23°C.

2. The *yungas* and valleys of Cochabamba, Tarata, Cliza, Punata, Arani, Tiraque, Totora, San Antonio, Todos Santos, etc. These are the second most important coca-producing areas. Mean annual temperature 23°C.

3. The *llanos zone*: In some places in Santa Cruz and Valle Grande and certain parts of Tarija. The mean annual temperature is 23°C. and in some places 18° to 20°C.

4. The mountainous regions of Cochabamba with a mean annual temperature of between 15° and 18°C. and low humidity.

5. The plateau and Andean regions of the departments of La Paz, Oruro and Potosí which are extremely dry and have a mean annual temperature of between 6° and 12°C.

3. Altitude

It is widely believed that altitude is the decisive, or at any rate the most important, factor inducing coca-leaf chewing. This belief appears to be based upon a rather fragmentary knowledge of the habit of coca-leaf chewing and an exaggerated idea of the influence that a single factor can have in the formation of a human habit.

Before great altitude could be regarded as a decisive factor in coca-leaf chewing it would be necessary to establish:

(*a*) What is meant by great altitude, that is, above approximately what height does altitude in itself give rise to the habit. This cannot be established. The term "great altitude" is a relative one. In some countries 2,000 metres is a great altitude. In others, such as Peru and Bolivia, it is a medium altitude.

(*b*) That coca-leaf chewing is practised only in the plateaux or Andean regions at great altitude. As we shall see, this is not the case. Coca chewing is practised in regions and localities which vary in Peru from a few metres above sea level (Pacasmayo, San Lorenzo Islands, Callao, etc.) to 4,359 metres (Cerro de Pasco), and in Bolivia from 425 metres (Santa Cruz) to 4,500 metres (certain mining settlements near Catavi).[6]

In Peru and Bolivia the theory is advanced in some quarters that the inhabitant of the high plateaux, or "Andean man" as he is called, has peculiar biological characteristics as a consequence of living in the Andes. Accordingly, it is held that Andean man is physiologically and chemically different from man living at sea level.[7]

The theory nowadays has many adherents but has still to be proved experimentally. It is used by some not only to show that coca-leaf chewing is necessary or harmless, but also to explain a wide variety of other human phenomena, relating to so-called "Andean man". As was said earlier in connexion with climate, it is true to say that, generally speaking, altitude, like any other of the internal or external factors affecting man, does determine, to a certain extent, the habits of human beings. But it must be borne in mind that every human habit is the result of a multiplicity or complex of very varied factors; and that these factors interact, positively and negatively.

It therefore seems difficult to justify coca chewing on the grounds of great altitude. Further, it is pertinent to ask what is meant by "Andean man", a concept which cannot easily be defined. A purely historical or cultural criterion would be insufficient. The limitation of "Andean man" to the Aymara or Quechua Indian, or to both, would be open to serious criticism, since in the Andean region there are groups or descendants of Indians not belonging to the two ethnic groups mentioned. Moreover, for more than 400 years *mestizos* and whites have been born and have lived in the Andes. Coca chewing is much less common among the *mestizos* than among the Indians, and as a habit is practically unknown among the white population.

As regards altitude as a decisive factor in coca-leaf chewing, it should also be noted that:

[6] Catavi is situated at 3,900 metres and Potosí 4,100 metres. Both are major coca-leaf chewing centres.

[7] This theory has given rise to the thesis of high-altitude biology and the contention that men living at high altitudes are biologically different from men living at sea level. This thesis would mean that there must be a third specific biological human type, valley man or man living at medium altitude. While it may well be that the inhabitants of the high plateaux (American or Asiatic), the inhabitants of valleys and men living at sea level, have certain individual characteristics, this does not seem to warrant the conclusion that there are three different biological human types.

Indian Girl

(*a*) The altitude does not explain why large groups of the population in the same place or area chew coca leaf, while others do not. It frequently happens among members of the same family, living in the same place and in the same social and economic environment, that some chew coca leaf while others do not. It is worth noting that Indian women chew coca leaf to a much lesser extent than Indian men. An attempt has been made to explain this by the fact that the men do heavy work while the women do not. This explanation by the defenders of coca-leaf chewing implies the recognition of a new factor conducive to coca chewing and the implicit denial that altitude is the decisive factor. It should be added that in some areas the women perform

Indian peasant chewing coca leaf: notice the bowl in the right cheek

Photo credit: TRAUCHMANN

MAP NO. 307 UNITED NATIONS
OCTOBER 1950

Prepared for Narcotics Bulletin, Vol. II, No. 4 50-39095

equally heavy mining and agricultural work and still chew coca leaf much less than the men. Moreover, the men continue to chew coca even when their work, whether in field, factory or mine, is not heavy.

(*b*) There is no coca-leaf chewing in the Peruvian and Bolivian armies. The elimination of coca-leaf chewing during military service is accomplished without any difficulty as a result of improved nutrition and a healthier way of life. Many of the garrisons in Peru and Bolivia are at high altitudes: as at Cuzco, Cerro de Pasco, Potosí, Oruro, La Paz, Catavi, etc., but in no case do the soldiers find it necessary to chew coca leaf. It may be added that in these areas 70 or 80 per cent of the soldiers are Indians, the great majority of whom were coca-leaf chewers before they entered the army.

(*c*) In other parts of the world at high altitude, neither coca-leaf chewing nor any similar habit is practised. It is significant that at Chacaltaya, Bolivia, *mestizos* and whites born on the *altiplano* ski at a height of 5,480 metres without needing to chew coca leaf. To a lesser extent, Indians who have become assimilated to Western culture also ski without experiencing any need to chew coca leaf.

The argument that the altitude of the Andean regions is the cause of coca chewing overlooks these facts and also the fact that in not a few of the areas concerned chewers and non-chewers are always to be found in greater or lesser numbers. The following examples, based on personal observation, may be mentioned:

Peru

1. Puno, Cuzco, Cerro de Pasco and Junín, at altitudes between 3,400 and 4,700 metres, have a great concentration of coca-leaf chewers, but there are also large groups of non-chewers.

2. In places at medium altitude, such as Quillabamba (Cuzco) and in Huánuco, there are chewers and non-chewers. The same is true of Machu-Pichu (2,100 m.), Arequipa (2,363 m.) and Cajamarca (2,700 m.).

3. At lower altitude: Tingo María (500-600 m.) and in Uchisa, which is lower.

4. In the coastal zone, below 500 metres: Trujillo, Ica, the San Lorenzo Islands, Lima and Callao.

Bolivia

1. In the plateau zone at an average altitude of 3,500 metres: La Paz, Viacha, Huarina, Tiquina, Copacabana, Batallas, Acha-Cachi, Huarizata, Oruro, Potosí, Catavi, Llallagua, Huamini, etc.

2. At altitudes under 2,000 metres: in the *yungas* of La Paz and Cochabamba and in certain parts of Tarija.

3. In certain places on the plains of Santa Cruz, which are at an altitude of less than 500 metres.

It is true that in the higher regions, above 3,000 metres, the number of chewers increases and reaches considerable proportions. But this concentration would seem to be due less to the influence of altitude, than to the fact that in Peru 61.66 per cent of the total population lives in the *sierra* zone, while nearly 58 per cent of the total population of Bolivia lives in the highlands.

The concentration is due to historical and economic factors. The mineral and agricultural wealth of Peru is concentrated in the *sierra* and the mineral wealth of Bolivia in the *altiplano*. It is in these areas that nutrition, as we shall see below, and living and working conditions leave much to be desired.[7]

It therefore seems reasonable to conclude that the greater concentration of coca-leaf chewers at high altitudes is due to causes other than the effect of altitude. Altitude is not a decisive factor, but rather a secondary factor, the effects of which can to a great extent be eliminated by a general improvement in living and working conditions.[8]

III. Nutrition

The deficient nutrition of the Peruvian and Bolivian people, and more particularly of the large Indian population of the two countries, is recognized by official and unofficial sources.

The advocates of coca-leaf chewing argue in various terms that the chewing of coca leaf compensates for deficient nutrition in two ways:

(*a*) Because the coca leaf contains a high nutritive substance, "X". To date, the existence of this substance is no more than a theoretical assertion.

(*b*) Because the coca leaf contains vitamins.[9]

In this connexion it should be noted:

(i) That even if the coca leaf contains vitamins, it does not mean that they are totally absorbed during the process of mastication;

(ii) That, even if absorbed, they may be neutralized by the alkaloids contained in coca leaf;

(iii) That coca leaf is chewed dry which, according to some authorities, would mean the loss or substantial reduction of their vitamin value;

(iv) That the use of "llipta" during mastication might lead to the total or partial destruction of the vitamins.

At present, the fact is that where nutrition is highly inadequate coca-leaf chewing occurs on a large scale and it is known that the coca leaf mitigates or completely removes sensations of hunger because of its cocaine content. It seems reasonable to conclude that coca-leaf chewing is practised primarily to kill sensations of hunger, with all the undesirable consequences that this entails.

The correlation between coca-leaf chewing and the lack of adequate nutrition has been attested by many authors and by a large number of investigations and experiments, especially in Peru. With few exceptions, a large number of civil and military doctors, professors, teachers, army officers, farmers, labourers, landowners, etc., have stated that:

(*a*) Improved nutrition plays an important part in bringing about a gradual disappearance of coca-leaf chewing; and

(*b*) The present living conditions of the Indians and of many *mestizos* are such that they cannot provide themselves with the necessary minimum of food.

The argument that the frugality of the Aymara or Quechua Indian, or of both, accounts for the present nutritional deficiency is unconvincing. Frugality is one thing, the habit of eating too little or badly because one cannot get proper food, is quite another. It seems reasonable to suppose that the alleged frugality is a consequence of the economic and social conditions in which large sectors of the population of Peru and Bolivia live.

It is difficult to obtain full information regarding the nutritional situation in Peru and Bolivia since, in spite of the efforts of the two Governments, there are no

[7] For a study of living and working conditions, see the *Report* referred to in footnote [1].

[8] As regards measures of improvement, see in particular the conclusions and recommendations of the *Report* in the official part of the present issue of the *Bulletin*.

[9] As regards the vitamin content and its value, see the *Report* referred to in footnote [1].

complete statistics on the various matters which must be covered by a study of nutrition. Most of the existing studies are concerned with the calorie intake of particular groups of the respective populations.

The conclusions of the Hot Springs Conference regarding the weight and types of food and the calories required to maintain an adequate diet may be taken as a general guide. In both Peru and Bolivia comparative studies have been made on the basis of the Hot Springs figures.

According to the conclusions of the Hot Springs Conference, the average annual food intake should be 620 kg. plus 228 eggs. The following calory intakes were regarded as normal:

TABLE No. 1

	Calories		*Calories*	
Men	2,500	sedentary life	2,100	Women
	3,000	moderately active life	2,500	
	4,500	very active life	3,000	

The figures for women during pregnancy are 2,500 to 3,000 calories. For boys and girls, the intake varies between 2,800 and 3,800 calories, depending on age group.

Peru

1. The average annual food consumption per head is 355 kg. Comparison of the figures for the basic items included in this average with the average for Lima and the minimum established at the Hot Springs Conference gives the following table:

TABLE No. 2

	Peru kg.	*Lima*	*Hot Springs* kg.
Grain products	107	145	115
Tubers, Vegetables, Fruit	159	186	208
Meats	24	50	41
Sugar	19	47	16
Fats	6	16	23
Miscellaneous	13	—	—
	328	444	403
Milk	27	67	217
	355	511	620

The table shows that the average for Peru is 57.25 per cent of the Hot Springs minimum and 69.5 per cent of the Lima average. As is the case with all averages, however, the average does not mean that all the inhabitants of Peru can achieve it. The populations of the departments in which coca chewing is most prevalent make up the bulk of those who receive less than the average.

2. The average annual food intake by zones is as follows:

TABLE No. 3

Zone	*Annual* kg.	*Consumption of Coca leaf* kg.
North	382	1,400,000
Central	362	1,900,000
South	322	4,800,000

The average food consumption is not the same in all the departments in the same zone. Thus, the departments of Lima and Huánuco, which are in the central zone, have average annual consumptions of 453 and 259 kg. respectively, which means that an inhabitant of Lima consumes 75 per cent more foodstuffs than an inhabitant of Huánuco. Huànuco is the third greatest centre of coca-leaf chewing. In the southern zone, it is useful to compare the departments of Cuzco, Puno and Arequipa, with annual averages of 283 kg., 246 kg. and 325 kg. respectively. The first two departments contain the largest coca-leaf chewing centres and the last, Arequipa, is eleventh in the list of the thirteen most important centres of coca chewing.

3. The daily food intake per head in the southern zone is 767 grammes, which, given the types of food consumed, indicates a maximum of 2,000 calories. Generally speaking, the number of calories regarded as adequate for a moderately active life is 3,000. The figure must be increased in the case of heavy work such as that performed by miners, factory workers and some categories of agricultural labourers. Studies of the rural population of Peru show that the calory deficiency per head per day varies between 500 and 2,000 calories. The following table shows in more complete form the correlation between population, coca-leaf chewing, education, altitude and nutrition. The districts have been listed in decreasing order of coca-leaf chewing.

Indian peasants at the market place

TABLE No. 4

	Population	Indians (Percentage)	(Percentage) Consumption of coca leaf 1943-1944 (Kilogrammes)	Education (Percentage illiterate)	Altitude of capital town of department (metres)	Annual consumption of agricultural products in kilogrammes	Annual consumption of meats in kilogrammes	Total annual consumption in kilogrammes	Total daily consumption in grammes	meats as percentage of total diet	Average diet as percentage of total diet	Average diet as percentage of Hot Springs minimum
1. Cuzco	563,468	72*	2,200,000	82	3,410	283	45	328	898	13.6	72	53
2. Puno	646,385	92**	1,100,000	85	3,870	246	32	278	761	11.5	61	45
3. Huánuco	276,883	62***	800,000	72	1,912	239	20	266	729	7.6	59	42
4. Ayacucho	414,208	74***	700,000	85	2,761	238	48	286	783	16.7	63	46
5. Pasco	99,829	60***	600,000	59	4,359	282	56	338	926	23.5	75	55
6. Junín	400,332				3,266							
7. Cajamarca	568,118	14***	500,000	64	2,750	330	43	373	1,020	11.5	82	60
8. Apurimac	280,213	70***	500,000	87	2,392	253	39	282	772	13.8	64	47
9. Huancavelica	265,557	78***	500,000	83	3,770	234	32	266	728	12.0	59	43
10. Ancash	465,135	55***	500,000	68	3,027	303	34	337	923	10.0	74	54
11. La Libertad	404,024	15***	300,000	49	47	316	73	389	1,065	18.5	86	63
12. Arequipa	270,996	26***	300,000	38	2,363	325	96	421	1,133	22.8	93	68
13. Amazonas	89,560	20***	100,000	55	2,334	308	32	340	930	9.4	75	55
	4,746,708		8,100,000									

* Quechuas.
** Quechuas and Aymaras.
*** Predominantly Quechuas.

The preceding tables show that:

(*a*) The lowest nutritional indices generally occur in the areas where the chewing of the coca leaf is most prevalent and where the Indian population is densest.

The following table is obtained by grouping the nutritional indices for departments with more than 50 per cent Indian population and those for departments with less than 50 per cent Indian population:

TABLE No. 5

	Average as compared with Lima Per cent	Average compared with Hot Springs minimum Per cent
Departments with more than 50 per cent Indian population		
Cuzco, Puno, Huánuco, Ayacucho, Junín-Pasco, Apurimac, Huancavelica, Ancash	52.7	38.5
Departments with less than 50 per cent Indian population		
Cajamarca, La Libertad, Arequipa and Amazonas	84	61.5

(*b*) The eight departments with lower nutritional indices and the greatest proportion of Indians in the population occupy the first eight places in the list of areas where coca chewing is most prevalent. The only exception is Cajamarca which, with a 14 per cent population, is sixth in the list of coca-chewing departments. This might be explained by the following considerations:

(i) The number of *mestizos* chewing coca in Cajamarca is greater than elsewhere,

(ii) In view of the peculiar characteristics of the Quechua Indians in this department, it is more than likely that many of them, although in fact Indians, are shown as *mestizos* in the statistics consulted,

(*c*) The two interpretations are not mutually exclusive. On the contrary, they seem to be the only possible explanation of the fact that 500,000 kilogrammes of coca leaf are consumed annually in this department.

The higher indices for Cuzco and Junín-Pasco may be explained by the following considerations:

Cuzco

1. In the capital city, which has over 40,000 inhabitants and is the third largest in Peru, the nutritional level of some groups of the population is undoubtedly higher than the level in the department generally.

2. In some places in the department chewing is not practised as a result of economic, social and cultural factors.

Junín-Pasco

The higher index may be explained by the whites and *mestizos* who have better paid positions in the mines and are therefore able to feed better than ordinary miners, whether Indian or *mestizo*.

Nevertheless, 600,000 kilogrammes of coca leaf are consumed annually in Junín and Pasco. This figure might justify the conclusion that the number of *mestizo* chewers is probably greater than in other parts of Peru.

(*d*) The following annual average is obtained on the basis of a minimum production of 8 million kilogrammes a year, taking into account the approximate amount of coca leaf exported and used in the manufacture of cocaine in Peru:

	Per cent
Consumed	93
Exported	4
Manufacture of cocaine	3
	100[10]

[10] The annual figures are approximate and are based on the statistical data given in the *Report* referred to in footnote.[1]

Bolivia

1. In 1946, the average annual intake of food per head was 255 kilogrammes. This is 41.12 per cent of the Hot Springs minimum.

2. The average calorie intake per head should be about 2,625. According to the figures of the National Bolivian Commission the average is 1,200, or 54.2 per cent less than what is regarded as normal. The Commission made the following comparison between the Hot Springs minimum and the average consumption figures per head in Bolivia.

TABLE NO. 6

	Kilogrammes per head annually	
	Hot Springs	*Bolivia*
Fluid milk	225.	26.80
Eggs	4.14	2.60
Meat, fish, poultry	40.	17.15
Fruit and fresh green vegetables	120.	80.25
Sugar	15.	10.10
Fats (including butter)	25.	0.23[a]
Cereals	100.	62.93
Tubers and roots	85.	51.60
Nuts and vegetables	10.	—

[a] Not including animal fats.

It should be noted that the comparison is not conclusive, since the Aymara and Quechua population in particular has no share in the consumption of the products covered by the statistics. This means that the indices for most of the inhabitants of the *altiplano* are lower than those given. According to the report of the abovementioned Commission, "the Indian exists on the margin of the colonizing movement and his food consumption is reduced to a minimum". The report also states: "The excessive use of coca and alcohol must be a consequence of the malnutrition prevalent among the inhabitants of Bolivia".

3. According to an estimate made in 1944 and excluding the rural population, for which no data are available, the average annual consumption of meat per head was 27.5 kg. As is the case with any average, this figure does not mean that all those to whom it theoretically refers actually get as much as that.

4. The following table, compiled from the statistical information available, nevertheless indicates the relationship between the production and chewing of the coca leaf, and altitude and education.

TABLE NO. 7

Departments producing coca leaf	*Production in 1948 Kg.*	*Departments consuming coca leaf*[a]	*Altitude of capitals (Metres)*	*Consumption of coca leaf in 1948*	*Population*	*Education*
La Paz (Yungas)	3,468,000	La Paz	3,632	The total consumption excluding approximately 500,000 kg. intended for export is approximately 3,850,000 kg.	1,176,500 predominantly Aymara 654,000 predominantly Quechua 215,000 predominantly Aymara 812,900 predominantly Quechua 375,000 Quechuas 393,000 Pampeanos and Guaranís 131,900 Quechuas	According to recent estimates, 75 per cent of the total population is illiterate.
Cochabamba (Yungas)	831,000	Cochabamba	2,570			
		Oruro	3,706			
		Potosí	4,100			
Santa Cruz (Cercado, Sara Valle Grande)	50,000	Sucre	3,100			
		Santa Cruz	426			
		Tarija	1,957			

[a] The figures for the first four departments are for 1949 and the remainder for 1946.

Comparison of this table with Table No. 6 on nutrition is difficult, since the Indian population, the nutritional index for which is in fact lower than that given in Table No. 6, has been practically excluded from that table.

In the light, however, of the studies made of certain aspects of nutrition in Bolivia (see bibliography) it may be said that:

(*a*) In the departments of the *altiplano*—La Paz (except the Yungas), Oruro and Potosí—where the concentration of population is greatest for historical and economic reasons, nutrition is more inadequate and the chewing of the coca leaf more widespread.

(*b*) The density of population, combined with the unsatisfactory living and working conditions, and not the altitude, is responsible for increased coca chewing.

(*c*) Coca chewing is also found on a large scale in the Yungas of La Paz and Cochabamba, where the average altitude is less than 1,000 metres. In these areas, living and working conditions, especially of small farmers and agricultural labourers, cannot be regarded as satisfactory.

(*d*) Coca chewing is also practised although to a limited extent in some lowlands in Santa Cruz and even, it would seem, in Beni, where the altitude does not exceed 500 metres and the climate is semi-tropical. Here again general living and working conditions are not satisfactory.

(*e*) Apart from the quantity of coca leaf for export (approximately between 6 and 10 per cent), the remaining 90 to 94 per cent is consumed in Bolivia.[11]

IV. Conclusions

The following conclusions may be drawn:

(1) Neither the severe climate nor the high altitude

[11] Cocaine is not manufactured in Bolivia.

can be regarded as determining factors in the chewing of coca leaf. It occurs in areas of widely differing climates and at widely differing altitudes.

(2) Coca-leaf chewing is the result of the effect of a number of factors, the most important of which are malnutrition, unsatisfactory working and living conditions, and the influence of other adverse social, educational and economic factors.

(3) In the present state of knowledge, the theory that the coca leaf has food value cannot be maintained. Even if this were accepted as a hypothesis, it would be difficult to maintain the thesis that a product which contains cocaine can be a substitute for an adequate diet. Although coca-leaf chewing is not regarded as drug addiction, except in certain cases, it is nevertheless a form of drug habit and it is known that the habitual ingestion of toxics invariably results in, among other things, minimum food consumption, which substantially affects the intellectual, moral and physical qualities.

(4) Coca-leaf chewing today affects the largest population groups in Peru and Bolivia. Consequently, the social and economic development of those countries will, notwithstanding the praiseworthy efforts of their Governments, be greatly hampered until coca-leaf chewing is eradicated through an adequate social, educational and economic policy.

Bibliography

(*Besides the works mentioned in the text*)

1. "Censo nacional de población y ocupación de 1940", 9 vol. Dirección General de Estadística, Lima, 1944-1949.

2. "Population and Vital Statistics Reports", June 1949, Statistical Office of the United Nations.

3. "Demografía", Dirección General de Estadística, La Paz, 1942.

4. "La situación alimenticia en el Perú", Ministerio de Agricultura (S.C.I.P.A.) by L. Rose Ugarte, Lima, 1945.

5. "Geografía económica de Bolivia", I and II, by Jorge Pardo Gutiérrez, Director General de Estadística, La Paz, 1947.

6. "Subalimentación del indio", by Rosa Gutiérrez Chávez, Second Inter-American Indigenist Congress, Cuzco, June 1949.

7. "La solución del problema alimenticio del indígena", by M. Aragón, *idem*.

8. "Variaciones hemáticas y químicas del indígena peruano en el ejército", by Dr. A. Guzmán Barrón and Percy Salomon of the Laboratorio Central del Ejército, *idem*.

9. "The United Nations Conference on Food and Agriculture", Hot Springs, Virginia, 1943.

10. "Investigación sobre costumbres alimenticias en las zonas rurales del Perú", Ministerio de Agricultura, by A. C. Roncal, Lima.

11. "El cocaísmo y la alimentación en el Perú", by Dr. C. Gutiérrez Noriega, Lima, 1948.

12. "Consideraciones sobre la alimentación del indígena peruano", by Dr. Alberto Guzmán Barrón, Teniente Coronel del Ejército, Second Inter-American Indigenist Congress, Cuzco, June 1949.

13. "Alimentación en los Andes", by Dr. Carlos Monge, *idem*.

14. "Descocainización progresiva de la población indígena del Perú", Manuel Callo Zevallos, *idem*.

15. "Labour Problems in Bolivia", Report of the Joint Bolivian-United States Labour Commission, I.L.O., Montreal, 1943.

16. "El problema social en Bolivia. Condiciones de vida y trabajo", by R. Capriles and G. Arduz, La Paz, 1944.

17. "Encuesta continental sobre consumo e infraconsumo", Comisión Nacional Boliviana, La Paz, 1944.

18. "El presente y el futuro del problema alimenticio en Bolivia", information submitted to the Bolivian Government by Dr. P. Escudero, Buenos Aires, 1947.

19. "Memoria del Banco Agrícola de Bolivia", La Paz, years 1946, 1947, and 1948.

20. "Estudios sobre el abastecimiento de carne y productos de carne en Bolivia", by J. R. Loza, La Paz, 1944.

COCA LEAF: COLOMBIA[12]

In an attempt to study the serious problem of coca chewing, Dr. G. Bonilla Iragorri, Departmental Director of Health of Cauca, distributed the following questionnaire among medical practitioners in the department:

(*a*) What is your opinion on the consumption of coca as a nutritional factor, an economic factor and a social factor?

(*b*) Do you believe that the Government should continue to allow Indians to consume coca leaves daily?

The principal replies to the preceding questions can be summarized as follows:[13]

(1) *Coca is not a food.* From a physiological point of view coca does not constitute a food any more than tobacco. It would be a mistake to classify coca as an economy food. The consumption of coca has no biological foundation whatsoever. This plant contains no nutritional element and it is characterized by its alkaloid content.

(2) *Coca is a toxic and like all toxics is harmful.* Coca-leaf chewing is, in general, harmful to the Native population. Evidence of its harmful effects on nutrition can be gathered by careful observation of chewers as one travels through villages, towns and small communities in the interior of Colombia. The drug reduces the appetite and in the long run it will produce an organic disequilibrium between the energy used up and the material or fuel supplied. The loss of food entails a reduction of organic defences and this will predispose to disease and particularly to the development of tuberculosis.

(3) *Mastication can only be considered as a social evil.* It affects the Native population of almost all South America. Educational propaganda should be launched on a wide scale among the indigenous and peasant classes, particularly among the younger generation. The employers should be invited to replace the supply of coca by some other food such as brown sugar or meat, for example. The daily chewing of coca leaf has a great pathogenic power. Its effects are injurious to the individual or the race as well as to the economy of the country.

(4) *Suppression of chewing.* It should include two primary stages: first to break the Indian of his habit and then to put an end to the harmful industry. Another step would be to abolish the reprehensible custom of paying the native inhabitant part of his salary in coca leaves.

The consumption of coca being entirely domestic and restricted to the Native population, it is not very important as an economic factor in the general economy of the country. It should be mentioned that the indigenous inhabitants of the Guachicona district in La Vega, Cauca, sent a message to the President of the Republic in which they approved the decree for the eradication of the coca plantations.

The cultivation of the coca shrub might be replaced by other crops likely to improve the daily ration of the worker.

[12] Coca leaf chewing is mainly localized in the departments of Cauca and Huila which also are the most important producing regions. In 1946 the total production of coca leaves in Colombia was 225,000 kg.; 210,000 kg., i.e. 93.3 per cent of this production was for chewing purposes and 20,000 kg., i.e. 6.7 per cent for medical preparations (tinctures, extracts, etc.). Colombia neither manufactures cocaine, nor exports coca leaves. (document E/CN.7/110/Add.5)

[13] Annual Report of the Colombian Government for 1948 (document E/NR/1948/41).

CANNABIS

By Dr. R. J. Bouquet

Introduction

HISTORICAL STUDY OF CANNABIS*

Since very early times, the peoples of Europe have known and made use of hemp. Originating in Central Asia, and growing abundantly throughout the whole of ancient Scythia, the plant soon spread through the inhabited parts of Europe. It was very valuable to human beings, owing to its textile fibres, which provided them with clothing and ropes, and its seeds, from which they extracted oil. But even by those early times when hemp was first used in Europe, the tribes of the East and Central Asia had known about hemp and been using it for many centuries. The weaving of its fibre, the extraction of its oil, and even the use of its resin to provoke a special kind of intoxication, were all familiar to them. Probably, when we have knowledge of a larger number of ancient documents from the East, we shall discover curious accounts of the uses of hemp in remote antiquity. It would indeed be extraordinary if a substance, the use of which was to have a considerable effect on the social and politico-religious development of the peoples of Asia acquainted with it, had not left many traces in the monuments left behind by thinkers of those days.

The oldest document relating to hemp which we now possess is a Chinese treatise, the *Rh-ya,* of the fifteenth century B.C. It describes the plant, and states that there are two varieties, one producing seed and the other only flowers.[1]

There is also evidence of the use of hemp to produce a certain form of intoxication in the eighth century B.C. among the Assyrians. They called it *Quonoubou Qunnapu* (cf. the Hebrew Qanneb, the Arabic Qannob and Qinnab, the Persian Quonnab, the Celtic Quannab and the Greek Kannabas), and *Azallû*.[2]

ABOUT THE AUTHOR

Dr. Bouquet is Reader at the Institut des Hautes Etudes *of Tunis, a former member of the League of Nations Sub-Committee on Cannabis, and member of the World Health Organization's Expert Committee on Drugs Liable to Produce Addiction.*

* Superior figures in the text indicate reference to the "Bibliographic Notes" at the end of this article. (See page 29.)

The Sanscrit medical work known as *Suçruta* – (sixth or seventh century A.D.) based on translations and documents dating back to far distant times – mentions hemp as a medicament under the name of *B'hanga*. This term occurs in the earlier *Atharva Veda* (2000-1400 B.C.) and in the work of the celebrated grammarian Pannini.[3]

The *Kou-Kin-i-Tong*, a Chinese treatise on remedies (dating from the beginning of the Christian era), mentions the use of a hemp preparation (*Ma-Yo*) as an anaesthetic in surgical operations.[4]

The use of hemp gradually spread, not only in India, but in the Tigris and Euphrates regions, Iran and Arabia. Hemp appears, however, to have been unknown to the ancient Egyptians and the Hebrews, as there is no mention of it either in hieroglyphic texts or in the scriptures, and no hemp tissue has been found in ancient tombs.

It was only later that the recognition of the qualities of hemp spread to the Ionian Archipelago and Hellas. It has been claimed that hemp could be identified with the Nepenthes of *Homer* (*Odyssey*, Book IV, 219-232). It is doubtful, however, whether the reference is to hemp, or at any rate to hemp alone.

It is not until *Herodotus* (*Historiae*, IV, 75) that hemp appears for certain in Greek literature. Herodotus says that the plant is cultivated in Scythia and Thrace, and that the inhabitants of those countries make clothing from it and intoxicate themselves by breathing the vapours given off from the seeds when roasted on white-hot stones. That is a clear allusion to the inebriating properties of Cannabis.

Diodorus Siculus[5] relates that the Egyptian women of Thebes dispel anger and sorrow with the help of a potion based on hemp. The Greek physicians, however, were ignorant of the chief properties of the plant, for *Dioscorides* (IV-5) speaks only of the emollient qualities of its seeds. *Galen* and his contemporaries were little better informed.[6]

Among Latin writers, *Pliny* (*Hist. Nat.* XIX., 2, 9, and XX, 23), *Columella* (*De re rustica*, II); *Lucilius*, and *Celsius*, mention hemp as a textile, but give only very vague indications of its medical uses.

In the East, on the other hand, it was already known for its intoxicating qualities. The Sanscrit work *Zend-Avesta*,[7] composed in Northern Iran some six centuries before the Christian era, is the first to mention hemp (*Cadaneb*) and its inebriating resin. The Fourth Book of the *Vedas* refers to it sometimes under the name of *Vijahia* (source of happiness) and sometimes under that of *Ananda* (laughter-provoker).[8] It was not, therefore, for its textile properties that hemp was used in India to start with; at the beginning of the Christian era the use of its fibre was still unknown there.

It is solely to its inebriating properties that hemp owes the signal honour of being sung in the *Vedas*, and it was probably the peoples of Northern Iran who discovered those properties, for they were already using the leaves (*Cheng*) and the resin (*Cers*) as inebriants and narcotics before the Hindus.

It was thus through the Iranian tribes that the priestly class in India—the only educated class at that time—learned of the properties of Cannabis, at a period which we cannot, at present, determine exactly.

Some curious documents contain information about the part played by hemp in certain religious ceremonies in India. Here is what *Kaempfer*, a doctor in the service of the East India Company, says:[9] "In Malabar, at the time of the sacrifices in honour of Vishnu, virgins pleasant to behold and richly adorned were brought from the temple of the Brahmins. They came out in public to appease the god who rules over plenty and fine weather. To impress the spectators, these young women were previously given a preparation with a basis of hemp and datura, and when the priest saw, by certain symptoms, that the action of the drugs was about to show itself, he began his invocations. The Devadassy (servants of the gods) then danced, leapt about yelling, contorted their limbs, and, foaming at the mouth, their eyes ecstatic, committed all sorts of eccentricities. Finally the priests carried the exhausted virgins into the sanctuary, gave them a potion to destroy the effect of the previous one, and then showed them again to the people in their right mind, so that the crowd of spectators might believe that the demons had fled and the idol was appeased".

Elysée Reclus (*L'homme et la terre*) mentions similar practices.

The mendicant monks, or fakirs, have made use of hemp preparations from the earliest times, and still do so. "Their object in using this drug", writes *Mohamed Shirazi Kalenderi*, "is, in addition to their pleasure in the visions it engenders, to dry up the seminal fluid; they thereby diminish the inclination to sexual pleasure and can the more easily avoid libertinage".*

A Persian work of the thirteenth century, "The Good Literary Auguries concerning the Virtues of Hemp", the poems of *Mohamed Dimashki*, and those of *Ahmed Halebi*, relate that a powerful sheik, *Haïder*, who had become a monk, discovered the plant. Shortly after his death, the use of hemp spread throughout Khorasan.

It was also through religious sects that Cannabis became known in Asia Minor and Syria.

While it is easy to show that the priestly classes knew and used the properties of hemp, it is difficult to establish where and how its use as an inebriant was learnt by the common people.

* See also R. N. Chopra and G. S. Chopra.

In Hindustan, in distant ages when the secret of the priests was revealed or stolen, hemp was used solely for the preparation of potions. The Brahmins appear to have attempted to control its use. They authorized it only on the occasion of certain important religious celebrations (Kali festivals, Druga-Puja etc.). We cannot know whether the people readily accepted the restriction of their consumption of Cannabis potions to the permitted dates; nor can we say whether it was not precisely in order to gratify the passion for the intoxicating drug, while at the same time respecting the law promulgated by the ministers of the divinity, that the custom of smoking hemp arose. This practice, more attractive, quicker in its effects, and less dangerous, spread with great rapidity, and at the present time smokers form the great majority of the hashish addicts of India.[10]

Persia, Asia Minor, Egypt, and other Moslem countries, which became acquainted with the use of Cannabis later on, learnt simultaneously to ingest it and to smoke it.

The great impetuous wave from Asia which, beginning in the seventh century, flooded Syria and then Northern Africa with believers, brought the use of hashish in its wake. Arab doctors of the period frequently used it as a remedy.

Iraq became acquainted with it in the reign of the Caliph *Mostanser Billah* (thirteenth century).

The Arab invasions probably introduced it into Northern Africa and made it known in Spain where its use did not become established.

In the Moslem world, in spite of the repeated prohibitions of the imams and the edicts and penalties of the emirs and sultans, hashish triumphed and triumphs still. As *R. Meunier*[11] so rightly says, "every Oriental is at once an artist and a metaphysician; he has the gift of conceiving forms and unity, the abstract in the concrete; but he has a great disdain for works and a lazy disinclination to act; he is an artist only for himself, whence his taste for intoxicants and especially for hashish, which conjures up visions of dazzling forms, of which each possesses an intense emotive coefficient".

In Europe, however, Cannabis was known only for its textile properties. Occasionally its seeds were used as medicine.

In the sixteenth century, more was learnt about hemp in Europe; it was the age of long voyages and great discoveries. Indian hemp must then have reached Europe from time to time.

The plant was drawn for the first time by *H. van Rheede* (*Hortus Malabaricus*, 1678-1692), who states that the natives of Malabar intoxicate themselves by smoking its leaves.

More information is given in the "Herbarium Amboynense", published at Hanau about 1690 by *Rumphius*, Councillor to the Dutch East India Company at Amboyna. He describes certain differences between Indian hemp and that of Europe: appearance, size, resin production etc. He notes that hemp is smoked mixed with tobacco, and that it dispels melancholy and produces pleasant dreams, but that its effects vary with the individual, and occasionally provoke a kind of madness.

In 1692, *Kaempfer*[9] tried the effects of Cannabis preparations on himself and his companions during a cruise in the Persian Gulf; he has left a detailed account of his observations.

Chardin,[12] in his "Voyage en Perse et autres lieux de l'Orient" (written about 1711), states that various compounds (*banghi, buengh*) with a basis of Indian hemp, poppy, and *nux vomica* are used in those regions.

Linnaeus, in 1762, in "Amaenitates Academiae", describes the effects of hashish. He regards hemp as a narcotic, whereas *Murray* (*Apparatus Medicamentorum*, 1787) states that it is a stimulant and aphrodisiac.

After Bonaparte's campaign in Egypt, attention was again drawn to the special properties of hemp, owing to the works and observations of the scientists who accompanied the expedition. *Silvestre de Sacy*,[13] *Rouyer*,[14] and *Desgenettes* studied hashish on the spot, while others, like *Virey*,[15] examined substances brought back from Egypt, and *Lamarck* studied samples brought from India by the botanist *Sonnerat*.[16] As a result, various memoranda were published in France in which Indian hemp was studied more thoroughly than ever before.

Attention having thus been drawn to the plant, it was discovered that it was used in a number of countries. *Von Martius* (1825) is the first to mention its use in America (by the Negroes of Brazil).

The first experiments in the therapeutic use of hemp were made in 1838, in Calcutta, by *O'Shaughnessy*;[17] at the same time, *Raleigh, Esdale* and *O'Birest* made the first attempts to carry out a chemical study of the resin extracted from the plant.

In 1840, *Moreau de Tours*[18] produced a remarkable work on the physiological action of hashish. Leaving the pharmacology of Cannabis aside, he studied only its action on the mental faculties, comparing hashish intoxication with a condition of artificially-induced madness (*Du hachich et de l'aliénation mentale*, Paris, 1845).

Many chemists set to work with great keenness, anxious to isolate the active element in hemp. Improvements in laboratory equipment and progress in research technique soon made it possible for scientists to direct their activities along less uncertain paths.

At the same time, physiologists and physicians determined to study the effects of Cannabis on man, and the addiction which it produces. There would be no point

in mentioning here the names of all these research workers.

I. Botanical Study

A. Origin and Morphology

The common hemp, *Cannabis Sativa* (L), is a dioecious plant belonging to the *Cannabinaceae* group of the *Urticaceae* family of the order *Urticales*.

Characteristics of the Urticaceae

The *Urticaceae* are apetalous plants, the flowers of which are generally unisexual, with a regular perianth, that of the male flower sometimes differing from that of the female flower.

The androecium is isostemonous in the male flower, whereas in the female flower the ovary is unicarpellary or bicarpellary, but unilocular and uniovular. The fruit is indehiscent (drupe or achene), the albumen small or non-existent.

Characteristics of the Cannabinaceae

The *Urticaceae* include trees, shrubs and herbaceous plants.

In the case of the *Cannabinaceae* group, in which the only important genera are *Cannabis* and *Humulus* (hop), the botanical characteristics can be defined in greater detail. These plants are herbaceous, either annual and upright (hemp), or perennial and voluble (hop). The leaves are generally opposite, with persistent stipules; the flowers are dioecious and unisexual, pentamerous at the calyx and at the androecium, the males spread out with straight stamens, the females sessile with bifid style and biflorous or uniflorous bracts; they are sometimes grouped in a raceme of cymes (*Cannabis*), sometimes in cones or catkins (female hop).

The ovule is pendant and campylotropous; the albumen fleshy, and the embryo curved.

Characteristics of the genus Cannabis

The genus *Cannabis* consists of a single species, *Cannabis sativa* (L), including perhaps two or three varieties.

The common hemp is an annual plant, herbaceous, reaching, *in the temperate regions of Europe,* a height of approximately two metres. The stem is upright, rectilinear, fluted and rough. The branches are fragile and short, the leaves palmate, generally with five, seven, or nine folioles (rarely eleven), very unequal, lanceolate and regularly dentate. Most of the leaves are opposite, but in the neighbourhood of the inflorescence and towards the top of the stalk they are very frequently alternate, simple or trifoliolate. On either side of a long petiole there is a straight pointed stipule.

The plant is dioescious: the male plants, smaller and more slender, wither and dry up fairly rapidly after flowering. This greater frailty formerly caused them to be referred to as female hemp. This confusion is found in *Lémery* (*Traité universel des Drogues Simples,* 1733) and in many earlier writers (*Matthiole, Dodoens, Tragus,* the *Bauhins* etc.), who give the name *Cannabis foemina* to *C. sterilis,* the male hemp. In German-speaking countries the male hemp, which is shorter, is popularly known as *Fimmel* (from the Latin *foemina,* female), and the female hemp, which is thicker in appearance and grows to a greater height, as *mäschel* (from the Latin *masculus*).

All parts of the plant, when rubbed between the fingers, give off a characteristic minty odour, which is particularly strong in the case of the female tops at the time of flowering. They are slightly sticky to the touch, and this stickiness is very marked in the highly-resinous hemps of hot, dry regions.

Male inflorescences

The *male flowers* are grouped in loose panicles: they comprise five greenish sepals and five episepal stamens with introrse anthers: in the centre of the androecium, a rudimentary ovary is sometimes to be found.

Female inflorescences

The floriferous branches of the *female plant* bear leaves and secondary branches, and the inflorescences form very contracted racemes of cymes intermingled with foliaceous bracts. The whole gives a robust, bushy, compact appearance to the female plant.

The *female flower* is topped by two long stigmas which are *sometimes* pink in colour; the calyx is urceolate; the ovary sessile, bicarpellary and unilocular, containing a campylotropous ovule which on maturity develops into a smooth globular achene, decorated with webbing of varying fineness and colour; it is surrounded by a bract, which is very rich in resin-secreting glands and is thought to be formed by the connexion of two stipules. The *seed* is almost completely lacking in albumen; the fleshy, curved embryo, with an incumbent radicle folded back on the cotyledons, contains oil and aleurone.

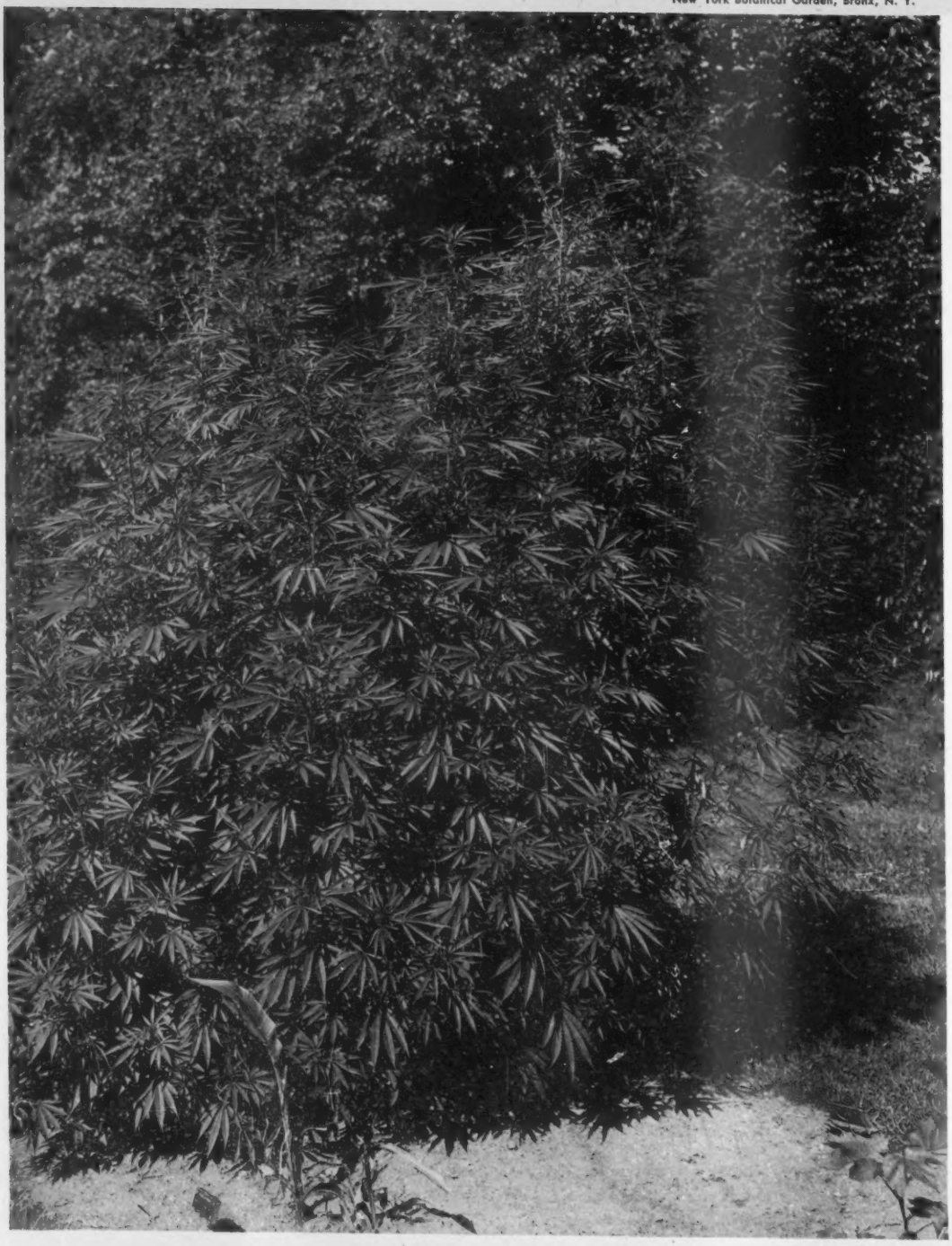
Fruit

The fruits of the hemp constitute the hemp-seed (*chènevis*), which can furnish 20 to 30 per cent of a siccative oil, formerly used chiefly for lighting and soap-making, and now in the manufacture of varnish and paint. Hemp-seed oil-cake finds little favour as food-stuff for cattle; but it is used as bait for fish, and also as a fertilizer.

Origin of hemp

Botanists now agree to regard hemp as having originated in temperate Asia, probably in the Irtysh region

New York Botanical Garden, Bronx, N. Y.



A plant of cannabis

(Dzungaria) and the Transbaikal territories. It must be supposed that it was merely naturalized, in very early times, in the Himalayan region, the Trans-Caspian provinces, the districts of Dahuria and Bokhara, the Lower Ural, the Volga Basin, and the Russian Caucasus, although it is commonly found in those areas. It was acclimatized in the Altaï and in Iran, Afghanistan and Baluchistan, and it is now grown in many parts of India and over a wide area of continental Europe. It has been imported and grows admirably in Lebanon, the Peloponnese and Mexico.

Adaptability

Hemp is to be found in countries with extremely different climates, altitudes, and conditions of sunshine and rainfall, and it is natural enough that the influence of environment should be reflected in very clear and marked changes in its external morphology, as well as in its physiological action.

The influences of light, drought and heat have a profound effect on its growth. Seeds from the same stock will produce, in the North of France, plants two metres high; in the alluvial plains of Piedmont, or in Virginia, the plants will grow to from three and a half to four metres; while in Northern Africa they are barely one and a half metres in height. Equally marked differences will be found in the formation of textile fibres and the production of resin. *Mr. Schaffer* (*Botanical Gazette,* Chicago, 1921, vol. 71, pp. 197-219) has even noted that hemp sown in the winter and exposed to a weak light has its sexual characteristics disordered, many flowers becoming hermaphoditic. As early as 1855, *Muller* reported that hemp grown by him at Patna had, in certain unfavourable conditions, become monoecious.

Rumphius had already noticed, in 1660, that Indian hemp cultivated at a certain altitude differed from that of Europe. *Lamarck*[20] and *Sonnerat*[16] were convinced that the genus *Cannabis* included several species. *Lamarck* even claimed that Indian hemp possessed opposite leaves while European hemp had alternate ones. There is no truth in that statement, and it will be seen that the phyllotaxic arrangement of the hemp plant varies according to whether the lower or upper portion is considered (*J. Bouquet,* 1912).

Different varieties

The changes, some of them considerable, which *Cannabis* undergoes in order to adapt itself to the very varying conditions of the districts into which it has been introduced, led to the mistaken belief that different species existed. Attempts were made to differentiate between the varieties known as *C. erratica* (Silv:), *C. Foetens* (Gilibert), *C. lupulus* (Scop:), *C. macrosperma* (Stock), *C. gigantea* (Lapin), *C. excelsa, C. compressa* (Husson), *C. sinensis* (Delille) etc.

Today, after the work of Forskall, Delille, Figari, Christison,[22] Baillon and others, botanists admit only a single species, *Cannabis sativa L.*, including the two (or three) following varieties (see League of Nations document 1542 r, p. 2):

(*a*) The *vulgaris* variety (or *Cannabis sativa,* var. *typica*): annual herbaceous plant; five to seven folioles; female inflorescences not very thick and not much contracted. Greyish achene with tegument having a very fine white webbing, height not more than 1.70 metres to 2 metres in temperate climates.

(*b*) The *indica* variety: annual suffrutescent plant with five, seven, nine or sometimes eleven folioles; female inflorescences very thick, condensed and contracted. Achene small, the tegument having black spots and discs, on a yellowish ground. Very high stalk (up to approximately 4 metres) in plants grown in the plains or in hot, damp climates, but not over 1.50 metres in wild plants or those grown in high cold districts or hot but dry regions.

(*c*) *The sinensis* variety, created by *Delille* and still accepted by certain botanists, should be rejected. Its characteristics make it akin to the *sativa* variety from which it only differs by its height: 4-6 metres (??). Introduced into France in 1827, it there rapidly acquired the characteristics of the *typica* variety.

It is true that, on the ground of slight morphological differences, a considerable number of varieties of Cannabis could easily be distinguished; but it should be remembered that the characteristics of hemp are very readily modified in cultivation, or by removal to different surroundings. The experiments of *Christison* and *Hope* in England (1847), and of *J. Bouquet* in France (1912), have shown that plants grown from seed brought from India become, after two or three generations, completely similar to indigenous plants. The converse also holds good (experiments of *Gastinel,* of *Husson* in Cairo, and of *Bouquet* in Tunis):*

In Egypt, when the Viceroy *Mehemet Ali* wished to create a navy, he got Cannabis seeds from Europe in order to obtain suitable fibre for cordage. New seed had to be brought periodically, because the hemp-plants obtained soon became incapable of producing good textile fibres. On the other hand, they began to secrete abundant quantities of the inebriating resin.

Thus hemp tends to be similar or different from the characteristic type, according to the conditions in which it is grown.

Aberrant variety

In exceptional cases these changes may appear suddenly, although the causes are difficult to determine. That, for instance, is an explanation of the appearance in

* See League of Nations document O.C. 1542 o.

the Tunis plantations, in 1936, of the late aberrant variety reported by *Dr. J. Bouquet*.*

Whereas the Cannabis cultivated for the Tunis monopolies for the manufacture of hemp for smoking, which is sown in March, is harvested on reaching complete maturity in July, a number of plants grown from seed of the same origin, and sown at the same time, do not flower and reach maturity till September. These latter plants yield less resin and more fibre.

Seeds from this aberrant variety, carefully collected in 1937, gave a crop, in Tunis in 1938, which retained all the same characteristics. Tests have been made by the United States Bureau of Narcotics with the same seeds: the plants flowered in August, when they were only 1.20 metres in height, but they did not mature until November, i.e., much later than the other varieties, which ripen about September.

Cultivation

In any case, all varieties of Cannabis have textile fibres of varying industrial value, and all produce physiologically active resin in varying quantities.

The cultivation of hemp requires special care. The following is the method recommended by Professor *Goris* and *J. Demilly* for hemp intended for the pharmaceutical industry (*Les remèdes galéniques,* Paris, 1925, p. 926):

"The choice of ground is important: hemp-plants strike out many tap-roots; the soil must therefore be light, loose and at the same time full of substance. The only preparation necessary is tilling and manuring. At least three tillings are necessary; the first takes place before the winter, the second in the spring when weeds are beginning to grow, and the third a day or two before the sowing, about the beginning of May or June (in North Africa there are only two tillings, and sowing takes place at the end of March).

"The choice of fertilizers depends on the nature of the soil: horse-manure, well mixed with other fertilizers, is suitable for heavy land; cow- or sheep-manure is better for light soils. (In Tunis a mixture of farmyard manure and superphosphates is used.) The sowing is in lines 20 cm. apart (in North Africa, 60 cm.). The arrangement in lines makes hoeing and thinning easier. The latter operation should be effected as soon as the hemp has its first two leaves; care should be taken, when superfluous plants are being pulled up, not to lay bare the roots of those near by.

"Once the hemp has reached a certain height, it grows rapidly. The male and female plants come up at the same time; but the former, though thinner, are taller until they have almost reached maturity. Their growth then stops. They blossom and spread their pollen on the female flowers, thus ensuring fertilization. They soon turn yellow, and their vegetation is practically at an end. (In the Tunis plantations they are then pulled up and destroyed, as their resin content is too weak.) The vegetative period of the female plants is longer: they are harvested about a month after the others. In Europe, harvesting takes place at the end of September, and in North Africa in July.)

"Drying in the open air takes five or six days in fine weather. If hot-air dryers are used, the plants can be dried within twenty-four hours."

Conclusion

To sum up: there is only one species of hemp (*Cannabis sativa*), of which *Cannabis indica* is only a variety. Both varieties have textile fibres and oleaginous seeds, and are capable of providing inebriant resin *if the circumstances of habitat and climate provide the necessary conditions.*

B. Production of Inebriating Resin

Appearance of the resinous glands

It is during the period of flowering and fruiting that the Indian hemp plant should be examined in order to study the process of resin formation.

1. Until it is on the point of flowering, the plant only shows

(*a*) Unicellular covering hairs—long, thin and ending in a sharp point. Rare up to the age of one month (in North Africa) or two months (in temperate climates), they subsequently increase progressively, and are particularly abundant on the floriferous axes, where they form a silky down (see "Marihuana: Its Identification");[40]

(*b*) Short hairs, swollen at the base, and set in the surrounding epidermic cells: their extremities are blunt: they generally contain calcium carbonate cystoliths. They are to be found for the most part on the upper surface of the bracts and leaves, and sometimes also on the lower surface of the limb.

2. When the *female plant* is about to flower, its tops, which already have large quantities of covering hairs, become covered with a multitude of pluricellular glandulose hairs. They appear to the eye as minute, shiny points. Their number is so great (in North Africa)* that the tops appear to be shining with dew: they are then so sticky that they have only to be pressed between the fingers for their various parts to stick together in a single mass: the fingers are left sticky and with a strong smell.

* And in Syria, Lebanon, Iran, the Indian uplands, Mexico, etc.

When the *male plants* flower, identical glandulose hairs appear, but in smaller numbers, on the leaves near the top, the bracts and the inflorescence axes (*Dr. J. Bouquet,* 1912[21]).

Morphology of the secretive hairs

If examined at the moment when the female flower is fully developed, these organs (which are reminiscent of the glandulose hairs of the Labiates) are found to have a globular head formed by four cells with voluminous kernels, with abundant protoplasm. They do not contain any chlorophyll pigments, but secrete an oleoresin which, seen through the microscope, is of a light amber colour. The base is constituted by two cubical cells, which likewise contain no chlorophyll and are themselves supported by two wedge-shaped epidermic cells.

These hairs grow and vary in appearance, for, at a more advanced stage, their heads include eight, and sometimes as many as twelve to sixteen, cells arranged radially.

They also vary in shape according to their position on the plant: for instance, on the outer surface of the bracts of the female inflorescence and on the axes of those inflorescences, the hairs attain a considerable development and have a distinctive appearance: they take the form of an elongated stem of homogeneous parenchyma, surmounted (like a mushroom) by an almost hemispherical top, consisting of eight to sixteen cells full of resin. Sometimes, on the other hand (especially on the lower surface of the leaves at the top of the plant), the stem does not develop, and the gland is reduced to a flat round head of eight to ten cells, which appears to be stuck on to the surface of the epidermis.

When the fresh plant is examined under the microscope, it is easily seen that the content of these secretive hairs is a liquid. In dry samples there is no longer any liquid, but a solid resinous mass.

These pluricellular glandulose hairs are the *external* secretive organs which perform the function of preparing the resin.

Location of the resin

The oleoresin secreted is stored between the cuticle, which it dilates, and the central part of the cell. It is easy to understand that, if the temperature is very high or the secretion very abundant, turgescence increases, the cuticle tears, and the oleoresin spreads over the surface of the bract, leaf or branch, where it dries. That explains the method of harvesting still in use today in certain parts of Asia, where the cultivators, dressed in leather, go about in the plantations at the hottest time of the day, in order that the resin may sick to their clothes or to the leather thongs which they draw over the tops of the plants.

Laticifers

Besides these glands the hemp plant also possesses other secretive organs, less important it is true, but none the less deserving of mention, namely, the *laticifers,* to which attention was first drawn by *Meurisse* (in his thesis "Le Hachich", Paris, 1891) as existing in the liber of the terminal portion of the adult stalks. *J. Bouquet,*[21] in 1912, showed that *laticifers* were present in all the vegetative parts of the plant (on both sides of the cambium at the level of the inflorescences, and lower down in the pericyclic region of the stalks, and also in the neighbourhood of the veins of the leaves).

These inarticulate *laticifers* have a homogeneous content of the same appearance and colour as the content of the glandulose hairs, and it is therefore possible that they assist in the preparation of the resinous element of Cannabis. However, the researches of *J. Bouquet,* confirmed by *MM. Fahmy* and *A. El Keiy,*[26] have shown that the *laticifers* secrete only an extremely small proportion of the resin in comparison with the glandulose hairs, and that there is no evidence that this substance is of a similar composition to that of the resin from the external glands.*

However, although it has hitherto been impossible to establish that the content of the *laticifers* has a similar composition to that of the resin secreted by the glands and consequently an inebriating property, and although it is obvious that the content can only be extracted by a solvent, it might nevertheless one day perhaps be possible to use the stalks as raw materials for extracting a substance which in its original state, or transformed, or modified, could be used by drug-addicts. It would therefore be wise to plan measures of restriction and control in the case of trade in Indian hemp stalks *when hemp is grown in districts where the resin yield is at all considerable.*

Duration of the resinous secretion

The production of resin, it will be seen, is most intense between the time when the flowers begin to appear and the time when the seeds are completely mature: it ceases when the seeds are ripe.

Variation and function of the resinous secretion

This secretion of resin does not vary in different varieties of hemp, but *depends largely on climatic conditions.* Non-existent or negligible in Northern Europe, it becomes considerable in the same variety of hemp when grown in hot, dry climates.

Mr. H. Burkill, Director of the Botanical Control Office in Calcutta, has noted, in connexion with hemp

* It may be the content of these *laticifers* which is responsible for the fact that very young male or female plants sometimes give positive Beam, Bouquet, Ghamrawy and Duquènois reactions, even when they are still too young to have developed the glandulose resin-secretive hairs on their surface.

grown on the high plateaux of Chinese Turkestan, that permanent lack of moisture and low barometric pressure promote an excessive secretion of resin in that part of the world.*

The fact is that the production of resin is primarily *a defensive reaction of the plant against high temperature and lack of moisture in the atmosphere.*** When the female flowers are blossoming, and at the time when the ripened and enlarged ovaries are about to provide shelter for the formation and development of the seeds, *it is a vital necessity* for the plant that the particular part in which those processes are going to take place should be protected from the danger of desiccation. Therefore it is at this period that the activity of the resin glands becomes intense: owing to the exudation of resin, the female tops are, as it were, smeared over with a protective coating, under which the life-giving sap of the plant can bring to the fertilized ovules those elements which are essential to their development. *An insulating "protective varnish" is necessary, so the plant secretes it.*

Where the drought is not so severe (whether the necessary water comes from the subsoil or the atmosphere), the plant does not need to devote its activity to the production of resin. The vegetative apparatus (leaves) and maintenance apparatus (fibres and stalks) develop to an increased extent; the plants are thicker and higher: but they produce less resin. In 1938, at Sedjenane (Tunis) hemp plants from the same lot of seeds were grown, some of them on a dry plateau, and some in a hollow where the subsoil had retained a certain amount of moisture. The climatic conditions were of course the same, as the two crops were only a few hundred yards apart. But the plants sown on the plateau did not grow higher than 1.50 metres; the others grew to 2 metres.

Production of fibres

The fibres only develop well when the plant suffers neither from excessive heat nor, more particularly, from drought. This leads to the following conclusions:

(*a*) *If Cannabis is to be cultivated for the production of resin,* plantations should be in hot, dry districts (especially those where there is no rain at the time of flowering and fruiting). The fibre produced is practically useless industrially, being hard, short and brittle. These are the conditions prevailing in Tunis, Morocco, Lebanon, certain parts of Iran, etc.;

(*b*) *If the object is to obtain textile fibre with a high industrial value,* hot, damp climates must be chosen for the plantations (as in the case with the hemp grown in the plains of India). In temperate climates valuable fibre is also obtained, but the crops are always better in hot rainy years;

(*c*) It is essential, particularly in the case of hemp grown in hot, damp districts, to remember that if the object is to obtain textile fibre the crop should be cut when the male plants start flowering. At the time of flowering, the hemp (like all plants) devotes its whole energy to the perpetuation of the species. The fibres do not then develop any more, and the yield of textile fibre will not increase. It is therefore better to harvest at that period, when the production of resin—if it takes place—is still slight.

This method has, of course, the disadvantage of sacrificing the seed, the market value of which is far from negligible. There is only one solution for the problem—to allow cultivation with a view to obtaining seed for industrial purposes in temperate districts only, where scarcely any resin is produced.

II. Drugs obtained from Indian Hemp

Drug-addicts use three kinds of hemp product:

1. The flowering tops (containing a portion of the leaves);

2. The resin secreted by the tops;

3. Complex mixtures in which Cannabis or its resin are associated with synergic substances, spices, aromatic substances and various excipients.

A. Hemp in its Natural State (*leaves and flowering tops*)

Synonyms

Bhang, Ganja, (India)
Kif, (Algeria, Morocco)
Takrouri, (Tunis)
Kabak, (Turkey)
Hashish el Keif, (Syria, Lebanon)
Djamba, Liamba, Riamba, (Central Africa, Brazil)
Dagga, (Southern Africa)
Marihuana, (North America)
Suruma, (Mozambique) Rongony (Madagascar)
Maconha, (Brazil) etc.

All these names are used to designate the tops and leaves of the female Cannabis which have not undergone any form of treatment except drying and sometimes chopping.

Bhang

Bhang is the product obtained in India by drying leaves plucked while still green. Some kinds are made of leaves only, while others are mixed with male and female inflorescences. The whole substance is often reduced to a coarse powder. Bhang contains about 15 per

* In her study on the Cannabis of Lebanon, Miss E. Safi[27] notes that hemp cultivated in the plains gradually loses the property of supplying active resin. Generally speaking, a certain altitude is required for resin production (hashish).

** See League of Nations document O.C. 1542 o.

cent of water, and does not keep well; protected from the sunlight and the action of moist air it may keep for three to four years.

Bhang is regarded as an inferior-quality drug, and is seldom smoked.* Watery (*buengh* or *poust*) and alcoholic (*lutki*) macerations are prepared from it. *Lutki* with an addition of opium and datura to strengthen its effect is called *mudra*. A kind of electuary is prepared from it with rice flour of Salep obtained from the bulbs of *Eulophia* (*Orchidaceae*) and the addition of spices and aromatic substances. Bhang is sometimes used in the preparation of native remedies.

Ganja

Ganja consists of the flowering and fertilized tops of the wild or cultivated female plants.

There are three kinds of ganja:

(*a*) *Flat ganja*. The cut stalks are tied together in bundles, the large leaves are eliminated, and only the inflorescences, which are stuck together by the exuded resin, are kept. The bundles of inflorescences are placed on the ground and trampled underfoot to flatten them. The bundles are then untied, and the product sorted and packed under the name of *Large flat* or *Ewig-flat*, according to the length and breadth of the stems.

(*b*) *Round ganja*. Instead of being trampled underfoot, the tops are rolled in the hands until they have become rounded and tapered in shape. This kind of ganja is always packed in bundles (generally of twenty-four pieces).

(*c*) *Chur-ganja, or Rora*. The tops, detached intentionally from the plants, or accidentally from the flat or round ganja, constitute what is known as Rora. This is generally delivered to the consumer in the form of a coarse powder.

Some people consider *Guaza* to be synonymous with Ganja; others hold that it indicates an inferior quality coming from Bombay.

Ganja has a pronounced fetid smell, much appreciated by addicts. The only variety that reaches Europe is the *Flat ganja*. The other two kinds are consumed in the regions where they are produced. For the most part, they are smoked.

Kif, Takrouri, etc.

Kif, Takrouri, Kabak, Hashish-el-Keïf, Djamba, Dagga, and *Marihuana* are synonymous terms. They are used to designate the female tops of wild and cultivated hemp, reduced to some form of coarse powder. They are smoked in pipes or in cigarettes, mixed with tobacco or alone.*

In certain countries (e.g., Tunis and Morocco), the drug is a State monopoly.

If the consumer prepares his drug himself, he merely removes the *seeds*, large leaves and large inflorescence axes from the tops, and crushes the remainder in the palm of his hand. In the case of a State monopoly (as in Tunis), after the leaves and seeds have been eliminated, the tops are ground in a mortar and sifted.

In America, the tops are also coarsely pulverized before being mixed with tobacco (see: Marihuana: Its Identification—plate 31).[40]

B. Indian Hemp Resin

The crude resin of Indian hemp is known in Asia by the name of *Charas* (more rarely, *Churrus*); in the Levant as *Hashish;* in French North Africa as *Chira;* and in the Egyptian Sudan as *Kamonga*.

The resin is a product which exudes spontaneously in minute drops—which become solid on exposure to the air—on the tops of Indian hemp plants (especially the female plants) growing in hot, dry districts. It is generally sold compressed into lumps of various shapes.

Central Asia, India

Although Cannabis (both wild and cultivated) grows abundantly in Hindustan, there is very little production of charas. Until recent years most of the latter came from Central Asia (Chinese Turkestan), and the principal market was at *Yarkand*.

There the charas grown on the northern spurs of the Chung-Kyr mountains and bought in Khotan, Zanju, Kugiar and Karghalik was collected. *Kashgar* was the main depot for the crops bought at Yangi-hissar and Rabat Kupriuk and grown on the last shoulders of the Pamir and the southern slopes of the Tianshan mountains.

From Yarkand, caravans brought the charas into the upper Indus valley, following the famous Black Jade road (Kara-Kash), which crosses the formidable Karakoram pass at a height of 5,562 metres and goes on to Leh. (This trade was conducted under licence from the Government of the Punjab, issued by the British Commissioner in Leh).

Charas likewise came from Central Asia through the Chitral pass. A certain amount also came through Peshawar. There was a large illicit market in Bajaur; the drug was brought there by caravans across Afghan territory.

---

* In India it is used by beggars and poor fakirs for chewing, and plays an important part in the rituals of many Hindu temples, being regarded as a sacred plant.

* It has been pointed out[50] that at Laghouat (Southern Algeria) a variety of the drug used for *sniffing* is sold. In addition to Cannabis this contains a certain proportion of the following mixture: powdered Souf tobacco, leaves of Araar (*Juniperus oxycedrus*) pulverized into ashes of Remt (*Haloxylum articulum, chenopodiaceae*).

Exportation to Russian Turkestan (market at Samarkand), Afghanistan and Iran used to take place from Yarkand and Kashgar by the old "Silk Road", passing through the upper valleys of the two rivers Kizil-su (Red Waters), which open up like broad trenches between the Alaï and the Trans-Alaï at a height of over 3,000 metres.

Collection

(*a*) *From uncut plants:* at the time when the seeds are formed, the cultivators, dressed in leather, move about through the plantations. The resin sticks to their clothes, which are scraped from time to time with a blunt curved knife. This method of collection shows clearly that in those regions the plant does not grow to any great height.

In other parts of the world, all that is done is to drag strips of leather, attached to a handle like a cat o'nine tails, over the plants; or to roll the resinous female tops between the palms of the hand, the charas being collected by scraping the fingers on the edge of some receptacle.

These methods produce a superior quality of charas.

(*b*) *From cut plants:* a second crop is obtained by threshing the plants, which, after being pulled up, are placed to dry on hurdles. The charas falls in the form of dust which is collected on pieces of cloth.

A similar method is employed in the Levant for the preparation of *Hashish* (*Chira*). In other parts of the world, the cut tops are pressed between coarse cloths, to which the resin sticks. The first process produces the quality known as *Sighirma*. By repeating the treatment with more energetic rubbing, a less valuable product called *Hurda* is obtained.

In Chinese Turkestan, the newly-dried tops are given three successive rubbings between fine matting. The produce of the first rubbing constitutes the superior quality known as *Rup*. The second gives *Tabgalim*, which is less highly valued; and the third produces *Gañja*, which is of very little commercial value.

Treatment

The impure crude resin obtained by these different processes undergoes various forms of treatment before being offered for consumption. (See D. Hooper[32].)

Sometimes the resin, after sifting, is kneaded with a little water into a lump, which is left to dry in some dark but well-aired place. It is then cut up into sheets, 3-6 cm. thick. These are dark brown outside and a lighter brown inside. If the resin is that collected from uncut plants (i.e., the very best quality), the paste, while still sticky, is kneaded by hand in copper pans, dirt and impurities are eliminated, and the substance is divided up into little lumps (*guabza*), which are often given the form of sticks, sometimes flat and sometimes tapering, weighing from 30 to 40 grammes. This variety is rare, and is greatly valued in the illicit traffic in the East.

In Chinese Turkestan, when charas is collected from the cut plants, it takes the form of a greenish-yellow powder, which is sifted so as to get rid of waste vegetable tissues and impurities. It is generally packed in cloth, and sometimes in skin bags, which are steamed above a pan of water. When cooled and compressed, the substance gradually agglutinates and forms a compact and resonant block. The same method of preparation is used in Asia Minor, Syria and the Lebanon.

Characteristics

Traders and addicts can easily tell whether charas has been collected from uncut plants or from those which have been cut and dried; in any case, the first kind is always more expensive.

First quality (obtained from uncut plants). Small sticks or cakes weighing not more than 150 to 200 grammes. The colour is brown and becomes deeper with age. The consistency is slightly granular. On the surface there are often lines and fingerprints owing to the fact that the cakes have been kneaded by hand.

The fresh product has a heady and agreeable smell, reminiscent of *Calamus aromaticus* (*E. Lépinois*[31]), or of mint (*D. Hooper*[32], *J. Bouquet*). When the drug becomes old, this scent gradually grows weaker, until it changes to a slight sweetish odour which becomes offensive in very old samples. However, even in the case of stale samples, the characteristic smell of Cannabis is clearly perceptible on exposure to heat.

Second quality (obtained from cut plants). Is generally found in fairly large lumps of a brownish-grey or sometimes greenish colour, which do not crumble easily, but can be cut without difficulty, showing a smooth and shiny section. The smell is little different from that of the first variety.

This quality of charas is generally sold in cloth or skin bags weighing from 1 to 1½ kg. When the bags have been filled with powder, they are exposed for a few moments to steam from boiling water, then stacked one on top of another and subjected to strong pressure, which turns them into flattened packets (the *Turbahs* of the Levant) with rounded edges, about 25 cm. long by 15 to 16 cm. wide and 4 to 5 cm. thick.

Whatever its origin, charas deteriorates if it is not kept away from damp.

The Levant and Northern Africa

The Cannabis resin which constitutes the charas of India is known by the names of *Hashish* (in Egypt, Asia Minor and Syria) and *Chira* (in Northern Africa). Chira (hashish) has the same qualities as those of the

Indian charas (second quality). The method of preparing it is rather like that employed in Sin Kiang.*

Hashish (Chira) is found in the illicit traffic in the form of flattened bags (*Turbahs*), the weight of which varies from half a kilogramme to two kilogrammes, and in the form of "soles" weighing not more than 250 grammes. When packed in the form of thin soles, Chira could be brought in by smugglers who hid it in their shoes. The "Turbahs" and "soles" often bore an inscription mentioning the name of the manufacturer and the place of origin. At the present time, distinctive marks (aeroplane, lion, etc.) are sometimes found, together with short particulars of origin.

Microscopic examination

If a small quantity of charas (chira or hashish) is observed under the microscope, it appears to be almost entirely formed of hairs, whole or broken, stuck in yellowish or brown shapeless lumps and mixed with fragments of vegetable tissue (bracts, bits of inflorescence axes and leaves); crystalline substances (fragments of cystoliths of calcium carbonate, and isolated or twinned crystals of oxalate of calcium) are also found to be present.

Uses

Charas (chira, hashish) is chiefly used for smoking. It is also used in the preparation of mixtures and electuaries for ingestion (these will be studied later on).

Activity

Charas (chira, hashish) is infinitely more dangerous than natural hemp. There is nothing surprising in this. Whereas the female hemp tops contain at the most 8 to 12 per cent of crude resin, the content of charas (chira, hashish) is about 40 per cent, if not adulterated.

C. Preparations used in the Illicit Trade

Cf. Annual Reports of the Cairo Narcotics Intelligence Bureau, passim, and League of Nations documents 1542 d and 1542 o.

Classification

It is very difficult to catalogue the innumerable preparations that have been devised by hashish-addicts, for although they are often very similar they are called by quite different names in different districts.

* According to P. Lys[55], Cannabis is grown clandestinely in the Lebanon, particularly in the areas of Zahlé, Ras-Balbeck and even Homs. The Western exposure of the Lebanese mountain chain is less favourable because of the humid winds from the sea. Four varieties of hashish (chira) are prepared in the Lebanon:

First quality; Hashish Zahra (or Zahret el Kolch), brown: second quality; Zahret el Assa, light brown: third and fourth qualities; greenish-yellow or green, not so coherent, and much more crumbly.

PIPE FOR CHIRA

(North Africa)

(R'guila; Gargara)

Container

Polished Coconut (Nargil: hence "narghilé" applied to all varieties of water smoking-pipes).

Lateral Reed Tube

Jabbad, through which smoke is inhaled by the smoker.

Vertical Tube

Sâri, made of carved wood.

Bowl of clay

Hajar, at top of Sâri: a little chopped tobacco is put in, then with the metal pincers a few bits of red-hot charcoal and fragments of Chira (Charas, Hachich). The smoke gets through the layer of orange blossom water (Mâzar), or rosewater (Mâ Ouard) or simply water (Mâ) in the container; one inhales slowly and deeply through the jabbad.

The Chira itself was enclosed in a small linen bag bearing the mark "Stamboul extra". This bag was given the shape of a sole which traffickers used to place inside their shoes to evade customs and police search.

They can be divided into three categories:

(*a*) Complex drugs for smoking;

(*b*) Preparations for drinking;

(*c*) Sweetmeats and electuaries for eating.

These products are not used in the illicit export trade. They are prepared as and when required by local customers in the various countries where they are consumed, the reason being that such mixtures generally only keep for a short time, and the tastes of consumers vary from district to district.

When one of these products is referred to as "Egyptian ma'agun", for instance, it would be more accurate to say "electuary of the ma'agun type", because out of every ten samples no two will be found with exactly the same resin content, taste, colour, or consistency. The Tunisian majun and the Turkish or Syrian majun are of the ma'agun type, but do not contain the same spices and condiments. The same applies in the case of the "Dawamesk type" and "Helwa type" of mixtures and the small sticks for smoking of the "Hashish Kafur type".

It is therefore impossible to draw up a complete list of such products. A summary classification is adequate.

For the manufacture of all these drugs, the substance preferred is charas (chira, hashish); but if that cannot be obtained, the natural tops are used, although they are less rich in resin.

(*a*) *Preparations for smoking*

The commonest preparation of this kind used to be called "Hashish Kafur". This type consists of small thin sticks from 5 to 10 cm. long, made from powdered charas (chira, hashish) with the addition of opium and sweet-smelling substances.

Some of them contain, in addition to, or instead of, opium, the leaves of various Solanaceae (such as henbane and datura.

When the sticks are to be used, they are broken into small pieces, which are introduced into cigarettes.

The *Anassa* or *Nassa* in Russia, mentioned by *Dr. Stringaris*[33] was probably a product of this type.[34, 35]

(*b*) *Preparations for drinking*

There are two classes of such preparations:

(1) *The Assis type.* A maceration of leaves or tops in cold or tepid water. As Cannabis resin is insoluble in water, these mixtures can only have an effect if they contain a high proportion of the plant. For that reason, the plant is generally crushed in a mortar and the necessary quantity of water added to obtain a fluid paste. The whole is then swallowed.

(2) *Esrar type.* These are alcoholic macerations (the resin is soluble in alcohol) which are mixed in various proportions with perfumed syrups or jams diluted in distilled water of roses, jasmine, or orange-blossom.

Bers (or *berch*), *chastig*, and *chats-raki* (with a basis of alcohol scented with anise) are of the Esrar type. Each manufacturer has his own secret formulae. These products are not exported.

League of Nations document 1724 b, quotes Sinka renko[36] as stating that a drink of the Esrar type appears already to be doing great harm in Asiatic Russia.

(*c*) *Preparations for eating*

It is to the preparation of this variety of product that the clandestine manufacturers have devoted the greatest ingenuity. There is a considerable number of such prodducts and full use has been made of sweet-making recipes.

(1) *Manzul type.* About 10 per cent of charas (hashish) is mixed with oil of sesame, to which cocoa-butter is often added. The mixture is then worked into a thick paste with powdered chocolate and a mixture of crushed spices and condiments.

Some recipes use crushed almonds, pistachios, walnuts, hazel-nuts, and pine-seeds; others use nutmeg, ginger, pepper, cloves and cinnamon; others again use the seeds of celery, onion, garden cress and quince. It all depends on the social status of the prospective purchaser. It should be noted that most of these substances have a reputation as aphrodisiacs in Arab medicine.

The mixture is kneaded by hand into a thick paste, which is flattened and cut up into small discs 1 cm. thick and 3 cm. in diameter.

These discs are intended to be slowly chewed.

The *Helwa* (Haloua, Heloua) have a composition similar to that of Manzul. They are harmless sweetmeats, and have a large sale in the Mediterranean Basin. Sometimes chira (hashish), opium, nux vomica, cantharides etc., are added to them extemporaneously.

(2) *Ma'agun type.* Synonyms: Magoon (India), Majun (Turkey), Madjun (North Africa). This type is fairly similar to Manzul in preparation. Honey is added to a mixture of chira (hashish), spices and aphrodisiacs. Then gum-arabic powder is added, until a hard paste is obtained, which is divided into pellets for swallowing.

(3) *Dawamesk type.* The Cannabis tops or chira (hashish) powder are put to simmer in butter at a moderate heat. The butter is very often replaced by sweet almond or sesame oil. The mixture is then strained. The fatty extract thus obtained is flavoured with mace, cinna-

mon, cloves, musk or various essences. Aphrodisiacs (nux vomica, cantharides, etc.) are often added.*

Mapushari is a compound of the same kind, generally with an addition of powder and essence of roses.

The products known in various regions as *Mosmok, Mosjuk, Teriaki, Banghia, Malak, Assyuni* and *Teridka* belong to the same category.

(4) *Garawish type.* This is a paste, which cracks between the teeth. Chira (hashish) powder is mixed with well-cooked syrup, opium and Datura Stramonium being sometimes added. It is scented with various essences and spices (vanilla, cloves, cardamoms cinnamon etc.). It is thickened over a gentle fire and then emptied onto an oiled marble slab. The mixture solidifies on cooling and is then cut up.

Formerly, kinds of barley sugar prepared in a similar way could be obtained in Tunis.

Other sweetmeats which are commonly sold in the Levant and North Africa serve on occasion as vehicles for the drug, e.g.:

(i) *Stuffed dates.* The confectioner splits the date, takes out the stone, and replaces it by a paste which is coloured green and made of almonds, pistachios and sugar. In the illicit traffic, dates have been found in which the paste used for filling contained chira powder.

(ii) *Rahat Lokum* (Turkish Delight): a very common sweetmeat made of starch, sugar and water and flavoured with essences (orange, lemon, rose, banana etc.). Pistachios and almonds are added. The product is semi-soft, and is sold in the form of parallelepipedal pieces rolled in a mixture of sugar and starch.

J. Bouquet has had the opportunity of analysing three samples of Turkish Delight, one of which contained chira powder, and the other two very finely-powdered Cannabis tops.

(iii) *Kiste Kibarfi, Misari, Kulfi* (India and occasionally Egypt), *Briji, Capsh, Ikinji* and *Zabra* (Syria, Palestine) are forms of sweets containing Cannabis.

The above are the best known preparations. *They are however, only typical recipes.* No short list would be comprehensive. The makers and sellers of the drugs spend their time in thinking out recipes that will attract and keep their customers.

* A. CHARNOT[29] (*La Toxicologie au Maroc*, 1945) gives the formula of a Majoun-Dawamesk type electuary well known in Morocco:

	Grammes:
Shelled almonds, Shelled walnuts, Cubeb	ää 1,000
Nutmegs, Malaguetta pepper	ää 0.250
Datura seeds, Belladonna berries	ää 0.50
Cannabis tips, Honey	ää 1,000
Butter	0.500

The fruits, seeds and tips are pulverized and mixed with butter and honey.

The average dose would be about two coffee spoonfuls after meals.

D. Preparations used in Lawful Trade

Hemp resin is not used in medicine, any more than in industry, except occasionally in the native medicines of the countries where it is collected and those where it is consumed.

Pharmaceutical preparations

On the other hand, the *female tops of Cannabis* (indica variety) still appear in the official Pharmacopoeias of various States, as do *Alcoholic tincture of Indian hemp* and *alcoholic extract (firm or soft) of Indian hemp.* (Cannabis and its preparations, which are included in the XIth edition of the Pharmacopoeia of the United States, have been removed from the XIIth edition.)

Besides the above preparations, the following forms are found in trade:

Hydro-alcoholic extract of Cannabis,

Ethereal extract of Cannabis,

Pure, washed resin (Hashishin, Cannabine),

Fatty extract of hashish,

Alcoholic fluid extract of Cannabis,

Ethereal tincture of Cannabis.

In medical practice, Cannabis and its preparations at one time enjoyed a vogue which was not perhaps very justifiable. The results obtained from their use in therapeutics do not seem to show that they are indispensable.*

Use in phytotherapy

In 1922, the *Chemiker Zeitung* (10-12, p. 29) mentioned the use of preparations with a basis of Cannabis leaves as insecticides. The leaves and stalks are dried at as low a temperature as possible, and the desiccated product is reduced to a very fine powder.

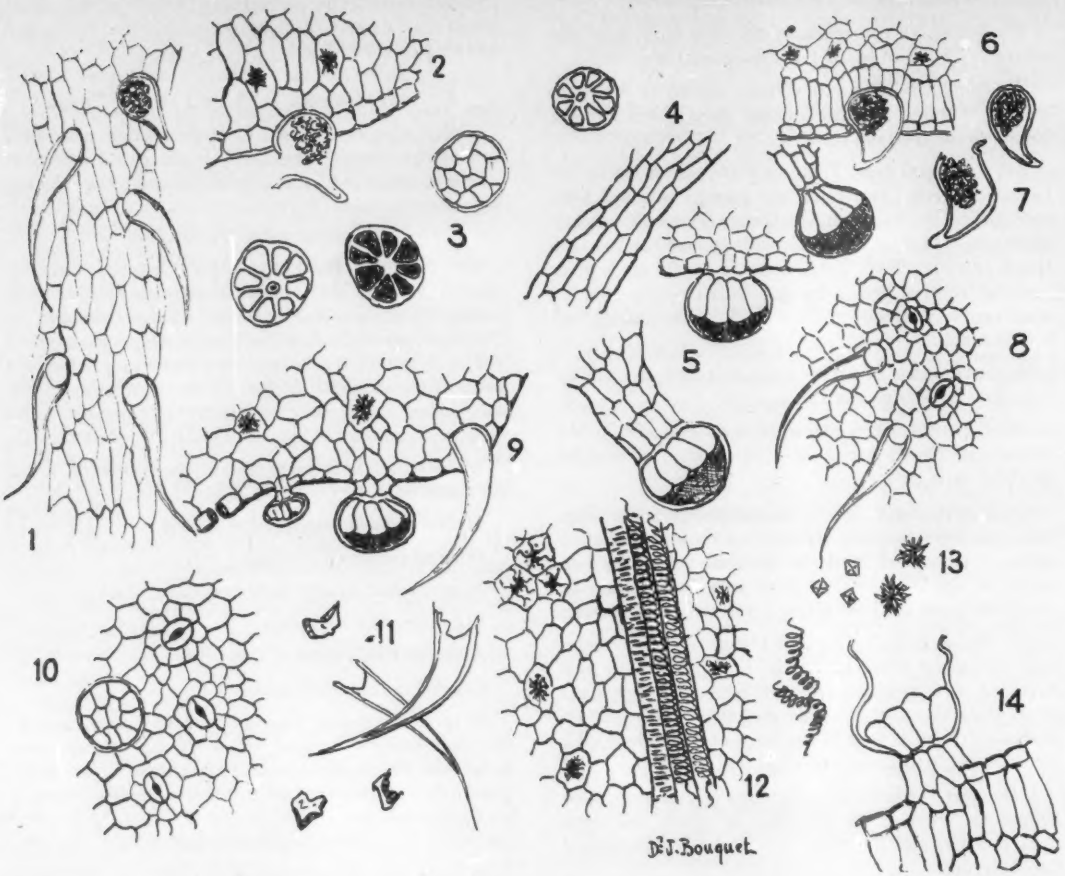
The powder thus obtained, when spread on pieces of material, woollen cloths, etc., or sprayed over plants, was said to protect them from the attacks of insects.

An alcoholic or ethereal extract may also be prepared from dried hemp leaves. Such extracts, diluted in a vaporisable solvent, are used in sprays.

There is also a reference, on page 50 of League of Nations document O.C. 1542, to the use of Cannabis for the destruction of caterpillars in the Netherlands Indies.

* The medical systems of India (Ayurvedic and Unani) make much use of Cannabis as a sedative, hypnotic, analgesic, anti-spasmodic and anti-hemorrhoidal. It is also a popular medicant reputed to be beneficial against rheumatisms, blennorrhagia, malaria, diarrhoea and mental disorders.[66]

CANNABIS POWDER SEEN THROUGH THE MICROSCOPE, ENLARGED 200 TIMES



Legend

1. Fragment of bract with pointed unicellular covering hairs and hairs with cystoliths of calcium carbonate.

2. Fragment of epidermis with a broken cystolithic hair and twin crystals of calcium oxalate.

3. Four resin-secreting hairs seen from the front: one is still swollen with resin, two are empty and the fourth (beside figure 3) still has its cuticle.

4. Fragment of pedicel of a secretory hair.

5. Three secretory hairs: two pedicellate, one sessile: the oleoresin is swelling and dilating the cuticle.

6. Fragment of upper epidermis of leafstalk with cystolithic hair.

7. Two detached cystolithic hairs: one intact, the other broken.

8. Fragment of lower epidermis of leaf or bract with two covering hairs and two reniform stomata.

9. Fragment of fruit bract with a covering hair and two secretory hairs in different stages of development; two twin crystals of calcium oxalate in the parenchyma; stoma on left extremity.

10. Fragment of lower epidermis of inflorescent bract: three reniform stomata, one young sessile secretory hair with cuticle (seen from the front).

11. Two broken unicellular covering hairs; three small pieces of solidified resin.

12. Fragment of floral peduncle with two spiral vessels and one pitted vessel; twin crystals of calcium oxalate and a group of three sclerified cells. On the right, broken spiral vessels such as are frequently found in the preparations.

13. Isolated and twin crystals of calcium oxalate.

14. A pedicellate secretory hair; the cuticle is broken and has released its oleoresin.

Note: The same elements are found in the chira, charas and hashish preparations. However, the fragments of tissues are much less numerous; on the other hand, there is a large number of the various types of hairs and of pieces of solidified resin (11). There are also numerous amber-coloured droplets of emulsified resin.

BIBLIOGRAPHIC NOTES

[1] E. BRETSCHNEIDER, "Botanicum sinicum", *Journal North China Branch, Shanghai; Royal Asiatic Society,* 1890-1891, 25-66.

[2] DR. J. CONTENAU, "La divination chez les Assyriens et les Babyloniens", Payot, Paris, 1940, page 49 *et seq.*

[3] F. HESSLER, "Ayurvédas", Erlangen, 1844, vol. III.

[4] STA: JULIEN, "Substance anésthésique employée en Chine dans le commencement du IIIème siècle pour paralyser momentanément la sensibilité", *Comptes Rendus de l'Académie des Sciences,* Paris, 1849, p. 195-198.

[5] DIODORUS SICULUS, Eng. trans., Heinemann, London, 1933.

[6] GALEN, "Die alimentorum facultatibus" (book I. ch. 34) and "De Simplicium médica: temperamentis ac facultatibus" (book VII. ch. 10), Kühn, Leipzig, 1823-1826.

[7] ANQUETIL DUPERRON, "Avesta, Vendidad", 1758.

[8] R. GRIFFITH, "The Hymns of the Atharvavedas", translated with a popular commentary, Bénares, 1895.

[9] E. KAEMPFER, "Amoenitatum exoticarum . . . fasciculi quinque", 1712.

[10] D'HERBELOT, "Bibliothèque orientale", Paris, 1697.

[11] R. MEUNIER, "Le Hachich", Blond et Cie, Paris, 1909.

[12] CHARDIN, "Voyages de M. le Chevalier Chardin en Perse et autres lieux de l'Orient", J. L. de Lorme, Amsterdam, 1711.

[13] SILVESTRE DE SACY, "Des préparations énivrantes faites avec le Chanvre", *Bulletin des Sciences médicales,* Paris, 1809, vol. IV, p. 204.

[14] P. C. ROUYER, "Description de l'Egypte et notice sur les médicaments usuels des Egyptiens", Paris, 1809.

[15] J. J. VIREY, "Remède exhilarant . . . selon Homère", *Bulletin de Pharmacie,* Paris, 1813.

[16] SONNERAT, "Voyage aux Indes et en Chine", Paris, 1802.

[17] O'SHAUGHNESSY, "On the Preparation of the Indian Hemp or Gunjah". *Transactions of the Medical and Physical Society,* Bengal, 1838.

[18] J. MOREAU DE TOURS, "Du haschich et de l'aliénation mentale", Masson, Paris, 1845.

[19] MÜLLER, "Préparations extraites du Cannabis Sativa dans l'Inde", *Journal de Pharmacie et de Chimie,* 1855, p. 296-298.

[20] J. B. DE LAMARCK, "Encyclopédie méthodique botanique" (vol. I), Paris, 1783.

[21] J. BOUQUET, "Contribution à l'étude du chanvre indien" (L'herbe aux fakirs) Legendre, Lyons, 1912.

[21A] J. BOUQUET, "Matière médicale de l'Afrique du Nord", Paris, Vigot, 1921.

[21B] J. BOUQUET, "L'utilisation du Takrouri des monopoles tunisiens; est-elle possible en pharmacie?", *Bulletin des Sciences pharmacologiques,* no. 12, Paris, 1936.

[21C] J. BOUQUET, "Contributions à l'étude de la Cannabis", *Archives de l'Institut Pasteur de Tunis,* vol. XXVI, section 2, 1937.

[21D] J. BOUQUET, "Nouvelles contributions à l'étude de la Cannabis" (2nd paper), *Archives de l'Institut Pasteur de Tunis,* vol. XXVII, section 4, 1938.

[21E] J. BOUQUET, "Toxicomanies orientales: hachich, chira et takrouri", *Vichy-medical,* nos. 8 and 9, 1937; no 1, 1938.

[21F] J. BOUQUET, "Quelques recherches sur le chanvre indien", *Bulletin Sciences pharmaceutiques,* nos. 3 and 4, Paris, 1938.

[21G] J. BOUQUET, "Le Théïsme en Afrique du Nord", *Journée pharmaceutique de Tunisie,* 1948.

[22] BOUQUET, GOBERT ET PÉRUSSEL, "Le cannabisme en Tunisie", *Archives de l'Institut Pasteur de Tunis,* vol. XIV, section 4, 1925.

[23] CHRISTISON, "On the Natural History, Action and Uses of Indian Hemp", *Monthly Journal of Medical Sciences,* London, 1851.

[24] J. B. GASTINEL, "Mémoire sur le haschich et ses applications dans la thérapeutique", *Répertoire de Pharmacie,* vol. 6, Paris, 1849.

[25] HUSSON, "Cours de Botanique", Cairo; Paris, 1847.

[26] I. R. FAHMY et M. A. EL KEIY, "Recherches sur le chanvre indien et ses préparations", *Journal of the Egyptian Medical Association,* vol. XIX, no. 1, 1936.

[27] MELLE E. SAFI, "Contribution à l'étude du chanvre indien du Liban", *Annales de la Faculté française de médecine et pharmacie de Beyrouth,* no. 4, 1935.

[28] H. BURKILL et D. PRAIN, Report on hemp in India, addressed to M. Chailley, Director of the "Union coloniale française" (not published).

[29] A. CHARNOT, "La toxicologie au Maroc", Larose, Paris, 1945.

[30] R. P. WALTON, "Marihuana, America's New Drug Problem", J. B. Lippincott, New York, 1938.

[31] E. LÉPINOIS, "Sur une préparation peu connue du chanvre indien", *Journal de Pharmacie et de chimie,* vol. III, Paris 1896.

[32] D. HOOPER, "Charas or Indian Hemp", *Pharmaceutical Journal,* 1908.

[33] M. G. STRINGARIS, "Zur Klinik der Haschisch Psychosen", *Archives: Psychiatrie,* 100, 1933.

[34] N. SKLIAR et A. IWANOW, "Ueber den Anascha — Rausch", *Allgemeine Zeitschrift für Psychologie,* 98, 1932.

[35] N. SKLIAR, "Ueber Anascha Psychosen", *Allgemeine Zeitschrift für Psychologie,* 102, 1934.

[36] SINKARENKO, "Widespread Use of Haschish by the Criminal Elements of Krasnodar", *Sovremienny Psychonevros,* nos. 4 and 5, 1930.

[37] Hassan Negm MOUSTAPHA, "Contribution à l'étude toxicologique du Hachisch et de sa prohibition en Egypte", thesis, Faculty of Strasbourg, Goeller, 1938.

[38] A. DARDANNE, "Contribution à l'étude du chanvre indien et, en particulier, de son emploi comme drogue sensorielle dans l'Afrique du Nord", thesis, Faculty of Paris, Vigot, 1924.

[39] E. PASCAL, "Contribution à l'étude du Chanvre indien", thesis, Toulouse, Impr. Véga, 1934. (Republished under the pseudonym DR. PASCAL BROTTEAUX: "Hachich, herbe de folie et de rêve", Véga, Paris, 1935.)

[39B] E. PASCAL, "Un révélateur du subconscient", *Revue métapsychique,* Paris, 1930.

[40] "Marihuana, its Identification", U. S. Treasury Department, Bureau of Narcotics, Washington 1939.

[41] S. DONTAS et P. ZIS, "Recherches expérimentales sur l'action du Haschich", *Archives internationales de Pharmacodynamique et de Thérapeutique,* 1928.

[42] Ch. BAUDELAIRE, "Les Paradis artificiels", Paris, 1860.

[43] Théophile GAUTIER, "Le club des Hachichins", serial in the *Presse,* 10 July 1843.

[44] Ch. RICHET, "L'homme et l'intelligence", Alcan, Paris, 2nd edition, 1887.

[45] R. BLONDEL, "Manuel de matière médicale, Doin, Paris 1887.

[46] D. N. PRENTISS, "Case of Intoxication from a Comparatively Small Dose of Cannabis Indica, *Therapeutic Gazette,* 1892.

[47] A. POROT et J. SUTTER, "L'épilepsie mentale chez l'Indigène algérien: sa fréquence, ses causes et ses aspects", *Algérie médicale,* 1938.

[48] Sir Th. RUSSELL, Annual Report (1937) of the "Bureau central d'information des Narcotiques", Boulaq, Cairo, 1938.

[49] F. T. MERRIL, "Marihuana: the New Dangerous Drug", Washington, 1938.

[50] A. DREYFUS, "Etude géographique et médicale de l'annexe de Laghouat", *Archives de l'Institut Pasteur d'Alger,* 1934.

[51] GUÈCHE, "Le hachich en Algérie", Paper submitted to the *World Narcotic Defence Association,* Los Angeles, 1931.

[52] Mazhar Osman UZMAN, "Hachich et démence précoce", *Chichli musamereliri,* 1916.

[52B] Mazhar Osman UZMAN, Report to the Sub-Committee on Cannabis, League of Nations (O.C./Cannabis/8) 27 April 1939.

[53] J. WARNOCK, "Insanity from Hashish", *Journal of Mental Science*, 1903.

[54] L. LEWIN, "Phantastica: Narcotic and Stimulating Drugs; Their Use and Abuse", London, 1931.

[55] P. LYS, "Le chanvre indien au Liban", *Annales de la Faculté de Médecine et Pharmacie de Beyrouth*, No. 6, 1933.

[56] A. POROT, "Les toxicomanies", Ferraris, Alger, 1945.

[56B] A. POROT, Report to the Sub-Committee, on Cannabis, League of Nations O.C./Cannabis/12, 8 May 1939.

[57] J. D. FRAZER, "Withdrawal Symptoms in Cannabis Indica Addicts", *The Lancet*, 6582, 22 October, 1949.

[58] YAWGER, "La Marihuana, une nouvelle toxicomanie", *American Journal of Medical Science*, March 1938.

[59] DANA, "Le Hachich et ses intoxications en Iran", Thesis, Faculty of Paris, 1938.

[60] Farheddin KERIM, "Troubles psychiques dus à l'emploi du Haschisch", *Hygiène mentale*, 1930.

[61] CÉAUX, "Les syndrômes mentaux dans l'intoxication chronique par le Kif, thesis, Algiers, 1944.

[62] P. O. WOLFF, "Dolor y euforia—adelantos farmacológicos", *Ciencia e investigación*, no. 5, Buenos Aires, 1948.

[62B] P. O. WOLFF, "La marihuana en la América Latina—La amenaza que constituye", *El Ateneo*, Buenos Aires, 1948. (Published in English by The Linacre Press, Washington, under the title "Marihuana in Latin America: the threat it constitutes", 1949.)

[62C] P. O. WOLFF, "Le traitement des toxicomanes", *Bulletin de l'organisation d'hygiène*, no. 4, vol. XII, Buenos Aires, 1945-1946.

[63] H. GRIFFON, R. PARIS, R. LE BRETON et Mlle. M. JANVIER, "Sur le trafic actuel du Chanvre. Identification et activité physiologique", *Annales pharmaceutiques françaises*, vol. V, no. 10, 1947.

[64] Professeur R. PARIS et Mlle. DU MÉRAC, "Teneur en résine et activité physiologique du chanvre cultivé dans la région parisienne", *Annales pharmaceutiques françaises*, vol. VII, no. 1, January 1949.

[65] A. R. TODD, "Haschisch", Expérientia, vol. II, 2, 1946.

[66] R. N. CHOPRA et CR. S. CHOPRA, "Etat de la toxicomanie par le chanvre dans l'Inde", *Bulletin Office international d'Hygiène publique*, 7.8, Paris, 1944, and *Indian Medical Research Memoirs*, Calcutta, 1939.

[67] Sir R. N. CHOPRA, "Present Status of Drug Addiction in India", report to the Expert Committee on Habit-Forming Drugs, January 1950.

[68] TWAIN MICHELSEN, "Lindesmith's Mythology", *Journal of Criminal Law and Criminology*, 1940.

[69] AUJALEU, "Toxicomanies par les végétaux", *Traité de Médecine de Lemierre*, vol. IV, Paris, 1948.

[70] Dr. GUILLERMO LAGE, "Estudio clinico de la intoxicación por la marihuana, *Revista de medicina y cirugia de La Habana*, no. 10, October 1943.

[71] Dr. Luis Muniz ANGULO, "La Intoxicación por la marihuana", *Revista de la Sanidad militar*, no. 8, Cuba, 1944.

[72] Prof. ROGER ADAMS, "Marihuana", Harvey Lecture, *Bulletin of the New York Academy of Medicine*, no. 18, 1942.

The most complete bibliographical indexes appear in: E. PASCAL, "Contribution à l'étude du chanvre indien", Pharmacy Thesis, Toulouse, 1934 (400 references). R. P. WALTON, "Marihuana, America's New Drug Problem", J. B. Lippincott Co., New York, 1938 (438 references). The most recent index (83 references) appears at the end of Dr. P. O. WOLFF's: "Marihuana in Latin America: the Threat it Constitutes", The Linacre Press, Washington, 1949.

References to documents of the:

League of Nations 2nd International Opium Conference, Geneva, 17 November 1924, 19 February 1925;

Records of the 2nd Opium Conference: 16th, 27th, 31st, 34th meetings, 2 volumes, C.760.M.260. 1924.XI;

Second International Opium Conference, ODC 55 (memorandum submitted by Dr. A. Mahfooz Bey);

Report ODC 72 (1), submitted by Prof. E. Perrot;

League of Nations: Advisory Committee on the Traffic in Opium and Other Dangerous Drugs:

May 1934 to March 1938—document O.C. 1542 to 1542 Z;

March 1938 to July 1938—document 1724 and addenda—1724 A, 1724 B, 1746 (1);

January 1939 to July 1939—document O.C./Cannabis/1 to O.C./Cannabis/12; alinea and to United Nations documents E/CN.7/W.37, 11 May 1948: Study on Cannabis sativa: item 14 of the agenda, 3rd session of the United Nations Commission on Narcotic Drugs; WHO/APO/21 27 April 1950. (Report by Drs. Cordeiro de Farias and Filho de Paneiras, on Cannabis Smokers. Text in Portuguese and English.)

Medical Aspects of Addiction to Analgesic Drugs

By Victor H. Vogel and Harris Isbell

U.S. Public Health Service Hospital, Lexington, Ky.

Before discussing a subject it is necessary to define it. In the past the most widely used definition of addiction has been that formulated by pharmacologists[1]* which states that addiction is a condition brought about by the repeated administration of a drug such that its use becomes necessary and cessation of it causes mental and physical disturbances. The symptoms which appear following withdrawal of morphine indicate the development of a state called "dependence" on the drug. Dependence may be emotional, physical, or both. However satisfactory this definition may be to pharmacologists, who are concerned only with the effects of drugs, it is not acceptable to persons who actually have to handle the human beings who are addicted. The pharmacological definition of addiction puts the cart before the horse because one has to take morphine for at least two or three weeks before any dependence is developed. Moreover, if dependence were the only important factor in addiction the solution of the problem would be very easy. One simply would permit addicts to have drugs so that their dependence would be continuously satisfied. It should also be noted that this definition makes coffee, tea and tobacco addicting substances because emotional dependence on these substances is just as marked as it is on cocaine or marihuana which are regarded as addicting drugs by practically all societies.

Any definition which makes dependence the central feature of the definition is undesirable because of the public's reaction to the term addiction. Laymen and even physicians believe that the use of an "addicting" drug is an extremely bad thing. Contrariwise, the habitual use of a "non-addicting" drug is not nearly so reprehensible and is not a matter of public concern. Actually, we are concerned about addiction and attempts to regulate the use of addicting drugs, not because individuals who use the drugs become dependent upon them, but, because the effects of the drug are harmful both to the individual and to society. The harm which the use of various drugs may cause arises in a number of ways. It may be due to a decrease in the potential social productivity of the addict as occurs during addiction to morphine and similar drugs, to the precipitation of undesirable and dangerous behaviour (even of temporary insanity) as may occur with the abuse of cocaine and marihuana, or to the mental confusion and impairment of motor function which are prominent features of addiction to either alcohol or the barbiturates. Dependence is important in addiction but it is important chiefly because it tends to make the addiction continuous rather than periodic and so increases the amount of harm which the addiction produces.

In recent years a number of psychiatrically oriented workers in the United States have formulated a definition which makes loss of self-control with reference to the use of the drug and harm to the individual or to society the essential features.[2, 3] This point of view was accepted in part by the Drug Addiction Committee of the National Research Council who, after long discussion, recently adopted the following definition: "Addiction is a state of periodic or chronic intoxication which is detrimental to the individual and to society which is produced by the repeated administration of a drug. Its characteristics are a compulsion to continue taking the drug and to increase the dose with the development of psychic and, sometimes, physical dependence on the drug's effects. Finally, the development of means to continue administration of the drug becomes an impor-

* Superior figures in the text indicate reference to the "Bibliographic Notes" at the end of this article. (See page 40.)

tant motive in the addict's existence". One should note that the leading sentence of this definition makes "detriment to the individual and to society" necessary to the definition of addiction and that the development of physical dependence is not a necessary characteristic of the term.

Under the terms of this definition, many drugs would be considered addicting. They include opium and some of its derivatives (morphine, heroin, dihydromorphinone [dilaudid], codeine, methyldihydromorphinone [metopon], dihydrocodeinone and eucodal); the synthetic drugs with morphine-like actions (meperidine [demerol or dolantin] and its derivatives, methadone [amidone, dolophine, "10820", physepteone] and all derivatives of methadone including isomethadone and heptazone [CB-11]); cocaine; hashish in any form; barbiturates; bromides; alcohol; peyote (mescaline); and amphetamine. Coffee, tobacco, and tea cause little harm and are culturally acceptable in most societies and are not regarded as addicting substances. In this article we will be concerned only with the medical aspects of addiction to the analgesic, or pain-relieving drugs.

The harm produced by Addiction to Analgesic Drugs

Many of the popular notions concerning the damage caused by addiction to analgesic drugs are completely erroneous. These drugs do not make individuals who use them into supermen. They do not cause the addict to indulge in crimes of violence or crimes of a sexual nature.[4] In fact, because of the soothing qualities of these drugs, they tend to decrease propensities to violent anti-social acts. Moreover, individuals who are tolerant to opiates show no outward evidence of intoxication and are very difficult to differentiate from persons who are not taking drugs. Individuals who are addicted to these drugs maintain good muscular co-ordination and, if sufficiently strongly motivated, can continue to work, although the amount of work produced is definitely impaired by addiction. It is perfectly correct to state that the physical effects of addiction to a narcotic drug are much less damaging than are the effects of addiction to alcohol, barbiturates or coca leaves. What then is the damage which these drugs produce and why are we concerned with them? The harm caused by addiction to analgesic drugs has been best described by Kolb[5] who said "When taken in large doses they (the opiates) sap the physical and mental energy; lethargy is produced, ambition is lessened and the pleasurable feeling already described—that all is well—makes the addict contented. These various facts cause him to pay less attention to work than formerly; consequently they tend to become idlers by these means alone . . .

"The dreamy satisfaction and the pleasurable physical thrill produced by opium in many addicts in their earlier experiences with it are of themselves forms of dissipation which tend to cause moral deterioration".

Thus the damage produced by narcotic drugs is traceable to the lessened social productivity and parasitic existence which addicts lead. In countries where addiction to opiates is culturally unacceptable the damage caused by the drugs is increased by social factors. In such situations, the unfortunates who are addicted to drugs must depend chiefly upon the illegitimate traffic in drugs for their supplies. Due to the high prices of illegitimate drugs, most addicts must engage in illegal pursuits in order to obtain sufficient funds to support their addictions, and must, therefore, associate with persons of low moral character. They are frequently arrested and sentenced to terms in jails and penitentiaries. All these factors tend to increase the unfavourable character changes and moral deterioration produced by the drug and convert people who might have been fairly useful citizens into outcasts, idlers and dependants.

Characteristics of Addiction to Analgesics

Addiction to opium and similar drugs is usually described as embracing three intimately related but distinct phenomena: (1) tolerance, (2) physical dependence, and (3) habituation.[6] It is wise to keep in mind that these terms are descriptive and do not constitute a definition of addiction.

Tolerance is defined as a diminishing effect in repetition of the same dose of the drug over a period of time or, conversely, a necessity to increase the dose to obtain an effect equivalent to the original dose. *Physical dependence* refers to an altered physiological state brought about by the repeated administration of the drug which necessitates the continued use of the drug to prevent the occurrence of the characteristic illness which is termed an abstinence syndrome. *Habituation* refers to emotional and psychological dependence on the drug—substitution of the drug for other types of adaptive behaviour. Habituation is closely related to the euphoric effect of the drug; that is, the relief of pain or emotional discomfort.

The mechanism of the development of *tolerance* to the analgesic drugs is unknown. The older theories of the mechanism have been reviewed by Eddy.[7] Most of them are unsatisfactory. Marme believed that morphine was oxidized in the body to a substance called oxydimorphine and that oxydimorphine had effects which opposed the actions of morphine. Other investigators have been unable to confirm Marme's theory. Gioffredi thought that prolonged administration of morphine caused the production of a substance which was a specific antitoxin for morphine but, in carefully controlled experiments, Du Mez and Kolb were unable to find any evidence of the presence of any antimorphine substance in the serum of monkeys who were tolerant to morphine. Other investigators have felt that increased destruction and excretion of morphine by the body might account for tolerance. This is quite unlikely since tolerance develops to some

effects of morphine at varying rates and on the other hand tolerance to certain effects never develops. Since morphine simultaneously stimulates and depresses different parts of the nervous system of animals, and since the stimulant effects outlast the depressant effects, Tatum, Seevers and Collins[13] postulated that, as addiction proceeds, there is an increment of stimulant effects which oppose the depressant action of morphine thus bringing about tolerance. Amsler stated that morphine produced a persistent change in the cells of the body which rendered the cells more sensitive to the stimulant effects of morphine and more resistant to the depressant effects of the drug. Cloetta and others have postulated that there is some increase in resistance of the reactive cells to morphine but do not explain how this increased resistance is brought about. The hypothesis which is most widely held at present states that administration of morphine brings into play certain physiological responses which oppose some of the actions of morphine.[8] Repeated administration of morphine strengthens the physiological counter responses and diminishes the effect of the drug. Wikler[9] believes that these enhanced physiological responses are actually conditioned reflexes.

Physical dependence is one of the most striking characteristics of addiction to analgesic drugs and its importance in the total picture of addiction has both been over-emphasized and minimized. Pharmacologists are prone to regard physical dependence as the primary and only distinguishing characteristic of an addicting drug. The reasons for rejecting this view have been stated above. Other individuals have denied the existence of physical dependence and have attributed withdrawal phenomena to anxiety or malingering. This latter view is certainly not tenable because physical dependence has been produced in dogs, monkeys and chimpanzees, and Wilkler[9] has shown that physical dependence can be observed in the paralysed extremities of dogs whose spinal cord has been severed as well as in dogs from whom all of the cerebral cortex (the part of the brain involved in thinking and emotions) has been removed.

The course of abstinence from morphine has been described in great detail by Himmelsbach.[10] If morphine is abruptly withdrawn from an individual who has been taking as much as 0.26 to 0.39 grammes daily for a period of 30 days or more, few signs are seen in the first 8 to 16 hours of abstinence. The patient is likely to go into a restless, tossing sleep which lasts several hours. About 12 to 18 hours after the last dose of the drug has been given, the patient begins to yawn, his nose begins to run, he starts to sweat and large tears form and run down his face. These signs increase in intensity and, during the second 24 hours of abstinence, the pupils of the eyes become widely dilated, the patients complain of "hot and cold" flashes and, on careful observation, one can see recurrent waves of gooseflesh on the skin. The gooseflesh resembles the skin of a plucked turkey and accounts for the origin of the term "cold turkey" which is used by the addicts in the United States to describe abrupt and complete withdrawal from drugs.

Thirty-six hours after the last dose of morphine has been given, uncontrollable twitching of the muscles begins. This twitching and jerking accounts for the term "kicking their habit". Severe muscular cramps develop in the legs, abdomen and back. Anorexia and insomnia become prominent. Vomiting and diarrhoea are frequently seen. The patient has a mild fever, the respiratory rate rises to 25 or 30 per minute and becomes irregular and sighing in character, and the blood pressure is slightly elevated. The addict is unable to eat and will probably lose five or six pounds during the second and third days of abstinence. The acute signs and symptoms reach their height 48 hours after the last dose of morphine was taken and remain at the peak until the 72nd hour of abstinence. Thereafter, all signs gradually subside and after 5 to 10 days the addict, though weak and shaky, is almost well. Difficulties in sleeping and small changes in pulse rate, temperature, and in the blood can be detected as long as three to four months after withdrawal. Thereafter, the physical state of the addict becomes completely normal unless he is suffering from some other disease.

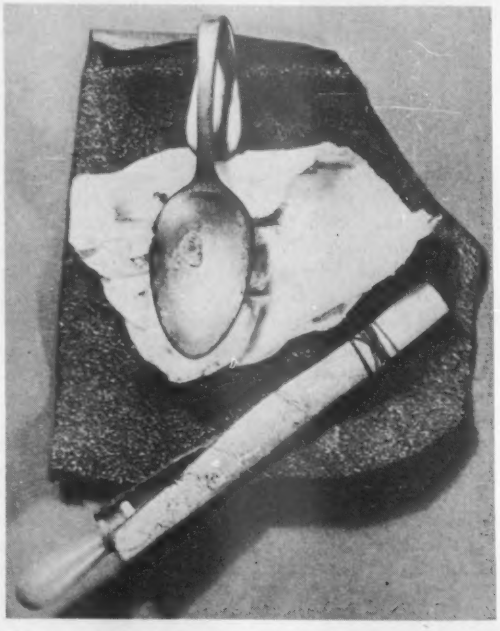
The intensity of the withdrawal sickness is more dependent on the dose of morphine the addict has been receiving than any single factor. Mild grades of abstinence can be detected in former morphine addicts after the administration of as little as 20 mgm. of morphine four times daily for 30 days.[3] Grades of abstinence which are as intense as any which can be developed with any drug for any period of time can be produced by the administration of 60 to 90 mgm. of morphine four times daily for 30 days. The picture of abstinence from opium (either smoked or eaten), heroin, dihydromorphinone and metopon is qualitatively similar to that of abstinence from morphine and the intensity is just as great. Abstinence from opium develops at about the same rate as abstinence from morphine, whereas, abstinence from the other drugs mentioned above comes on more rapidly than does abstinence from morphine and subsides somewhat more quickly. Abstinence from codeine, though quite definite, is less intense than abstinence from morphine, comes on more slowly and subsides more slowly. Abstinence from dihydrocodeinone is somewhat more intense than abstinence from codeine but less intense than abstinence from morphine. Abstinence from meperidine (demerol or dolantin) is milder than abstinence from morphine but comes on more rapidly and subsides more quickly than abstinence from morphine.[11] Abstinence from methadone comes on rather slowly, is mild in intensity, and subsides quite slowly.[12] Abstinence from methadone is qualitatively different from abstinence from morphine in that few of the signs which indicate involvement of the autonomic nervous system (yawning, running nose, tearing, dilatation of the pupils, and vomiting) are seen.

The mechanism of physical dependence, like that of tolerance, is still unknown.[7, 9] It is certainly not due to anatomical alterations in the cells. Many of the theories which have been proposed to explain the manifestations of physical dependence are identical with those advanced as explanations of tolerance. These include the oxydimorphine, antitoxic and pathobiotic hypotheses. Theories which are based on changes in the way in which the body handles water, theories involving reversible coagulation of the proteins of the cell, and theories involving the replacement of a cell constituent have all been shown to be without basis. The excitation theory of Tatum, Seevers and Collins[13] has had considerable vogue. According to this hypothesis, withdrawal signs are due to the stimulant actions of morphine outlasting the depressant actions. There are however a number of objections to the theory of Tatum, Seevers and Collins. Signs of abstinence from morphine in all species of animals are different from the signs produced by the stimulant actions of the drug. For example, these authors state that constriction of the pupil and slowing of the pulse are the result of stimulant actions. During withdrawal, instead of pupillary constriction and slowing of the pulse, dilatation of the pupils and increase in the pulse rate occur. Convulsions, which are one of the most striking stimulant actions of morphine in the dog, are not a feature of abstinence in this species. The stimulant actions of codeine are greater in proportion to its depressant actions than are those of morphine. One would therefore expect, on the basis of the theory of Tatum, Seevers and Collins, that dependence on codeine would be more severe than on morphine. The reverse is the case. The results of Wikler and Frank[14] on the reflexes in the paralysed hindlimbs of addicted chronic spinal dogs also do not support the views of Tatum and Seevers. The hypothesis, which is currently favoured by most authorities, states that signs of abstinence represent a release of the enhanced physiological mechanisms which oppose the actions of morphine from the brake imposed by the continuing presence of morphine in the body.[8] This particular idea appears to fit the known facts better than any other hypothesis yet advanced. Many of the signs of abstinence from morphine are qualitatively the opposites of many of the acute effects of morphine. Morphine depresses body temperature and during abstinence one sees fever. Morphine constricts the pupils and during abstinence one sees mydriasis. Himmelsbach suggested that the homeostatic responses which oppose the actions of morphine are mediated largely by the hypothalamus (the portion of the brain which is largely concerned with the regulations of temperature, blood pressure, etc.) via the autonomic nervous system. While this may be true, the experiments of Wikler show that other parts of the nervous system are also involved.

Habituation has been described by Himmelsbach as the psychical phenomena of adaptation and mental conditioning to the repetition of an effect. In more simple language, this means that the addict comes to use the drug as the answer to all of life's stresses. Rather than taking positive and definite actions about his difficulties, the addict temporarily defers the need for a solution of the problems by taking a dose of his favourite opiate. The directly pleasurable effects of the opiates are strongly reinforced in individuals who have been addicted by the relief which the drug affords from the symptoms of abstinence. Having once experienced the relief of abstinence by morphine, the addict comes to think of the drug as possessing magical qualities. He refers to it as "God's own medicine" and comes to believe that it is a "cure" for all mental and physical ailments.

The Cause of Addiction

In order to produce addiction a drug must have effects which certain persons regard as pleasurable. Kolb[5] distinguishes two types of pleasure following the use of morphine. Negative pleasure refers to relief of either physical pain or psychic tension while positive pleasure refers to elevation of the individual above his usual emotional plane. The pleasure which morphine induces in susceptible individuals is one of the most subtle and enjoyable sensations known to man. As mentioned above, the drug does not increase the efficiency of the individual, does not make him more courageous, and does



This is a crude outfit used by a North American addict for injecting morphine. It consists of an eye-dropper, a hypodermic needle and a spoon with a bent handle. The spoon is used for dissolving the drug and heating the solution over the flames of a match

not permit him to engage in long continued effort. Actually, morphine produces a sensation of pleasant relaxation, ease, and warmth. It resembles the feeling one gains after working in the garden or completing some other pleasant task. In this state, all worries vanish and the individual can sit and dream deferring all decisions until tomorrow. One should keep in mind that in taking drugs to induce this state, the addict is seeking the same thing we all desire — peace and comfort. He is merely going about attaining this universal human desire in a way which provides only temporary peace and which is in itself pathological. If the drug is taken intravenously, a pleasant tingling spreads through the entire body. This sensation is most marked in the abdominal region and has been compared by some addicts to the sensation of a sexual orgasm. Intravenous injection appears to be especially attractive to individuals with psychopathic personalities.

The meaning which the effects of morphine have for a given individual is dependent upon his personality characteristics. Psychically normal individuals do not have psychic tension, are already at ease, and are not impressed by the effects of the drug. To put it differently, they cannot be, or feel no need to be, raised above their usual emotional plane. If such persons are suffering from physical pain, the relief of the pain by morphine may be very impressive and may be interpreted as pleasure. Psychically normal individuals, however, feel no need for the drug once the physical disease which was responsible for their pain has disappeared. Individuals who are fundamentally emotionally immature childlike persons that have never made a proper adaptation to the problems of living are, however, greatly pleased by the effects of the drug. They find that morphine gives them a sense of relief comparable to the solution of a difficult problem or the shaking off of a heavy responsibility. Many of them feel that their efficiency is increased and that they can meet better adjusted people on equal terms. For a time, morphine seems to be the answer to their difficulties, but as they develop tolerance they find that they must take more and more to induce the desired effects. Finally, the drug will not produce the desired sensations at all, and the addict finds himself taking it to prevent the discomfort of withdrawal.

It follows, from what was said above, that the effects of morphine are much more pleasurable to individuals who have some type of psychic maladjustment than it is to psychically normal individuals. The types of individuals who are especially prone to addiction have been well described by Kolb and Felix[15] who list four general personality patterns.

The first personality group consists of cases who, during the course of a physical illness, received drugs over an extended period of time, and, following relief of their ailment, continued to use the drug. These persons are frequently termed "accidental" or "medical" addicts. Such persons are regarded by some authors as constituting a special group of addicts who differ from persons who began the use of drugs as a result of thrill and pleasure seeking and association with persons who were already addicted. In our experience, all "medical" addicts have some fundamental emotional problem which causes them to continue the use of drugs beyond the period of medical need. There is, then, no basic difference between "medical" and "non-medical" addicts except in the mode of their original contact with drugs. In persons with stable personalities, social pressures, conscience, and a well balanced make-up negate the pleasure produced by drugs sufficiently to prevent their continued use.

The second group consists of persons with all types of psychoneurotic disorders. Included in this classification are people who have a great deal of anxiety, are nervous, tense, and frightened or worried by minor matters; people who feel compelled to do things in a certain way and who become very uncomfortable if their routines are upset; and individuals who have strange inexplicable types of paralyses or losses of sensation in their extremities (hysterical persons). Individuals of this class begin the use of morphine because it relieves their anxiety and takes away whatever symptoms they may have. Even in the beginning, the drug is used to induce "negative" pleasure. Such persons do not ordinarily increase the dosage of narcotics as rapidly as do psychopaths and may remain on low dosages of morphine for years. These people usually have no criminal records prior to addiction, and their illegitimate activities after addiction usually are of a minor kind which are generally traceable to their great need for drugs. They are certainly deserving of pity and need treatment more than punishment.

The third group consists of psychopathic persons who ordinarily become addicted through contact and association with persons who already are using drugs. They are generally emotionally undeveloped, aggressive and hostile persons who take drugs for the pleasure arising from the relief of the tension arising from their unconscious aggressive drives. In many of these people, the use of morphine represents a means of expressing hostility and resentment against society. Many of these individuals are basically amoral and addiction is merely an incident in their criminal careers. This particular group of persons, which accounts for only 12 per cent of addicts in the United States, is responsible in great part for the public attitude regarding addiction. Since such individuals are basically criminals, the public has come to believe that all addicts are criminals and that the use of drugs leads to crime. Actually, it is likely that narcotic drugs inhibit the aggressive impulses of persons of this class and so reduces their propensities toward major criminal actions. As Kolb[4] said, morphine changes the potential murderer into a mere thief.

The fourth, and smallest group, is made up of individuals who are insane (psychotic) and who are also drug addicts. The mental illness in many of the persons in this classification is mild in degree and some of these persons seem to be able to make a better adjustment while taking drugs. It is often difficult to determine whether these individuals are actually insane while they are actively using morphine since signs of the psychosis do not become apparent until the drug is withdrawn.

Many addicts are difficult to classify exactly as to personality type. Many of them exhibit much of the overt behaviour pattern of the psychopath but, when studied more carefully, are found to possess psychoneurotic characteristics as well. Kolb originally described such persons as suffering from a vague, poorly crystallized personality defect which he termed a psychopathic diathesis. They are now classified under the terms of behaviour or character disorders. Types of individuals who fall into this borderline class include persons who unconsciously wish to be sheltered and protected, shy, withdrawn individuals who feel the world is against them, and people who seem to have never grown up. Most of the persons in this group make a marginal adjustment to life before becoming acquainted with narcotics. Once they begin the use of drugs they lose part of their normal adaptive patterns of adjustment and become parasites on society. This regression of personality and loss of social adaptation represents the greatest danger in drug addiction.

The mode of contact with a drug determines to a great extent whether an individual with a susceptible personality will become addicted. If contact with a drug results from legitimate medical administration during the course of illness, addiction seldom occurs. In fact, less than 5 per cent of addicts become addicted by this means. Contact with the drug through addict friends as a result of curiosity, association, thrill and pleasure seeking is a much more potent cause of addiction. This fact explains why so many individuals who have personality characteristics similar to those of addicts never become addicted. They do not have addict acquaintances.

Abuse of all types of drugs is based on the same personality factors, so that addiction to one drug predisposes to addiction to another. Thus an individual who abuses alcohol and receives morphine for the relief of symptoms of alcoholic debauches is very likely to change his addiction to morphine. Persons who smoke marihuana are frequently thrown into close contact with narcotic drug addicts and, as a result of the association, change from marihuana to heroin or morphine. In many instances the exchange of the original addiction, particularly in the case of alcohol and the barbiturates, for addiction to an opiate, represents a change for the better in the sense that the person has exchanged a greater for a lesser evil.

Addiction to opiate drugs is continuous and not intermittent as is frequently the case with alcohol, cocaine and barbiturates. This is usually interpreted as indicating that the addict fears the abstinence symptoms and continues to take the drug to avoid the pain of withdrawal. Wikler[14] believes that, in addition to the avoidance of pain, the relief of abstinence symptoms by morphine represents the satisfaction of a biologically determined need which is similar to the relief of other biologically determined needs such as hunger or thirst and is therefore pleasurable in a positive sense. This idea implies that addicts enjoy being dependent upon drugs so that they can experience the pleasure of the relief of the abstinence symptoms by morphine. It is possible that both mechanisms operate simulanteously in the same individual.

The tendency to relapse is also a striking characteristic of addiction to narcotic drugs. According to most authorities, the tendency to relapse is due to the fact that once drugs are withdrawn the same personality characteristics which predisposed the individual to addiction are still present. The proneness to addiction caused by these personality traits is greatly reinforced by the phenomenon of habituation, or emotional dependence. As Kolb says, the addict is so conditioned that he thinks of taking a dose of morphine when he is exhilarated or depressed. If an individual who has been an addict meets a friend on the street he is pleased and this leads to the idea of a "shot" to celebrate the event. If he becomes depressed or upset by any matter, no matter how minor, he is inclined to take the drug so that he can forget the problem or defer its solution until the following day. If he develops some illness and is uncomfortable, he remembers the relief which morphine gave when he was ill from lack of the drug and feels that he must have some of his magical "cure-all" to alleviate the manifestations of his present illness.

Diagnosis of Opiate Addiction

The appearance and behaviour of addicts who have developed a high degree of tolerance to morphine may be indistinguishable from the appearance and behaviour of individuals who are not taking drugs. Morphine does not produce staggering, slurring of speech or as great a degree of impairment of intellectual functioning as does alcohol or the barbiturates so that, so far as can be ascertained by casual examination, the addict may appear to be completely normal. The presence of numerous abscess scars in the skin and the finding of needle marks, particularly in the form of tattooing over the veins, are very suggestive. Emaciation arises only when the addict is in poor financial circumstances and spends all his available income for drugs rather than for food. Frequently it is necessary to isolate a person suspected of being an addict and allow him no drugs in order to determine whether he is actually physically dependent

Abscess scars on the arm and forearm of an addict. The abcesses are caused by self-injection of unsterile solution of impure drugs

Picture shows tattooing which occurs over the veins as a result of repeatedly injecting opiates intravenously

on drugs. If the characteristic signs of abstinence appear, the question is immediately settled. Tests are available for the detection of morphine and other drugs in the urine, but these tests are difficult to carry out and are not available to most physicians.

The appearance and behaviour of individuals who are addicted to methadone is identical with that of individuals who are addicted to morphine. Marked induration and inflammation of the skin over the sites where the drug is usually injected is a characteristic finding in addiction to methadone. Individuals who are taking large amounts of meperidine (demerol) may exhibit marked dilatation of the pupils, inco-ordination, uncontrollable muscle twitching and even convulsions. In the amounts taken by addicts, chronic intoxication with meperidine is even more undesirable than is addiction to morphine.

Treatment of Drug Addiction

Treatment of drug addiction can be divided into two phases; withdrawal of drugs, and rehabilitative therapy. Withdrawal is necessary and is the first step in treatment but is much less important than rehabilitative therapy and is the only part of the treatment of drug addiction which is easily accomplished.

Withdrawal of drugs from narcotic addicts on an outpatient or office basis should not be undertaken as it almost surely will fail. Withdrawal in any environment except that of a well managed institution under the control of persons trained in the treatment of addiction is difficult to accomplish. Withdrawal should be carried on in the quickest, smoothest and most humane manner possible so as to establish good rapport between the patient and the physician on which to base subse-

quent psychotherapy and rehabilitation. Abrupt and complete withdrawal of narcotic drugs carries a certain degree of danger and is unnecessarily cruel. This type of treatment tends to foster an attitude of resentment and hostility in the addict which greatly hampers efforts for his continued treatment. A withdrawal which is conducted too slowly tends to keep the addict mildly uncomfortable for long periods of time. He is, therefore, likely to become discouraged and to discontinue treatment. Simple reduction of the dosage of drugs over a period of 7 to 14 days represents a good method of denarcotizing the addict. Recently it has been found that methadone can be substitued for morphine without signs of abstinence appearing[12] and that the symptoms which do appear during reduction of methadone are milder than those accompanying reduction of morphine. This latter method of withdrawal has, therefore, become quite popular.[16]

Many physicians who do not have a complete understanding of the problem of drug addiction have devised various schemes of withdrawing drugs. About ten new methods are advocated each year and frequently these are spoken of as "cures". This fixation on withdrawal therapy is probably traceable to the idea that addiction is merely a matter of physical dependence and all that one has to do is to withdraw the drug. Many of these methods have been based on erroneous theories of addiction, are illogical and more dangerous than abrupt withdrawal of morphine. We are referring here to treatments which involve intensive purgation, inductions of convulsions by electric shock, raising huge blisters on the skin and injecting the blister fluid into the addicts, the use of scopolamine or hyoscine which makes the patient psychotic, the use of atropine, the use of insulin and of heavy sedation with barbiturates. As Kolb has pointed out, abstinence from morphine is a self-limited illness, and any withdrawal method which involves taking away the addict's drug will succeed unless the patient is killed in the process.

Adjunctive treatment during withdrawal includes the use of small doses of sedative drugs. It is important not to use large amounts of these agents since excessive sedation seems to accentuate the development of emotional upsets during withdrawal. Furthermore, the use of sedative drugs prolongs emotional dependence on drug therapy and one may succeed in transferring the addiction to barbiturates which is a far more damaging and serious matter than is addiction to morphine. Hydrotherapy in the form of continuous warm tepid baths is helpful in relieving excessive nervousness. Maintenance of a sufficient fluid intake is very important and a light ample diet should be supplied.

Emotional reactions to withdrawal are frequently much more difficult to handle than are the physical symptoms. Excessive anxiety, hysterical reactions, and attempts at malingering frequently occur. These must be handled by appropriate psychotherapeutic techniques as they arise. Generally, simple reassurance will suffice. Individuals undergoing withdrawal of drugs seldom become psychotic.

It has recently been both reported and denied that the operation of prefrontal lobotomy prevents the appearance of abstinence signs following withdrawal of drugs from addicted individuals. This operation consists of severing the frontal lobes from the other parts of the brain. It is difficult to understand how this operation would prevent the appearance of withdrawal signs since Wikler has shown that severe abstinence occurs in dogs from whom all the cerebral cortex has been removed. In any event, the operation produces considerable intellectual impairment and personality change and would not be justified merely on the basis of preventing signs of abstinence. Its use in addiction should probably be limited to the treatment of individuals with intractable pain. Whether the operation will so alter the personality of the addict that he will not relapse to the use of drugs has not been determined.

Rehabilitative Therapy

Whenever possible, any physical disease which the addict may have should be removed by appropriate therapeutic procedures after withdrawal has been completed. In cases of addiction associated with chronic diseases which are not completely curable, the treatment should be designed to produce the maximum possible degree of improvement and to teach the individual to manage his disease without resort to narcotics. In cases in which intractable pain plays a part in causing the addiction, appropriate surgical procedures designed to relieve the pain should be considered.

Time is an extremely important factor in handling drug addicts. Time is necessary not only to allow the altered physiology of the addict to return to normal (this requires about three to six months) but also time is necessary to break up his established habit patterns of using drugs as the answer to all his problems. The addict must learn to work, play, and sleep without drugs. Since time is such an important factor, some kind of coercion is frequently necessary. Many addicts may begin treatment with the best intentions in the world, but after a few days their basic personality difficulties assert themselves and they discontinue treatment. Coercion may take the form of pressure from friends, relatives or law enforcement officers. Frequently these measures fail and some type of legal action becomes necessary.

An adequate programme of occupational therapy is extremely important. Occupational therapy should not be a matter of weaving rugs, but should be so designed as to permit every patient who is capable of it an opportunity to perform at least eight hours of useful productive work daily. Whenever possible, the types of occupations available should maintain and add to any skills

Occupational therapy. This man has been withdrawn from drugs and is learning the trade of shoe repairman as part of his treatment at the U. S. Public Health Service Hospital, Lexington, Kentucky

which the addict may possess so that following discharge he will be well prepared to take a useful place in society. Individuals with physical handicaps should not be allowed to vegetate on infirmary wards but should do as much work as the limits imposed by their disabilities will permit.

Whenever possible, addicts should receive psychotherapy designed to remove or lessen their personality problems. The first decision is whether psychotherapy should be offered at all. The emotional development of many addicts was arrested at a very early stage and such individuals are very resistant to psychotherapy of any type. About all that can be done in such cases is to provide a short period of institutional supervision followed by a long period of supervision of the patient by his family, friends, minister, or probation officer following discharge from the institution. Other individuals who reached a greater level of emotional maturity prior to addiction should be offered intensive psychotherapy. Psychotherapy is an individual matter which is dependent not only upon personality characteristics of the patient but on the training, orientation, and skill of the person who administers the treatment. It is in no wise different from psychotherapy administered to non-addicts and complete description is beyond the bounds of this article. There are, unfortunately, not enough psychiatrists to administer psychotherapy to all addicts who need and will accept it. This deficiency in therapeutic facilities perhaps can be partially bridged by organizing group therapeutic sessions. Many patients seem to benefit from participation in the activities of the groups known as Alcoholics Anonymous and Addicts Anonymous.

Prior to discharge from an institution the patient should make a plan. If possible, he should have a definite place to go, a job, and friends to whom he can turn. He should remain under some type of supervision for several years. In planning and conducting this phase of treatment, the resources of a good social service department are invaluable.

Prevention of Drug Addiction

There are two basic approaches to the prevention of drug addiction: (1) mental hygiene programmes administered by public health authorities which have as their object the development of people so emotionally sound and well integrated that they will have no need for drugs, and (2) legislation designed to prevent narcotic drugs from going into channels where they will be easily available to addicts.

The first line of approach, although offering the greatest promise, is just getting under way and the results cannot yet be evaluated. The second approach, that of the enactment of legal controls, is known to be effective when well enforced. Prior to the passage of the Harrison Narcotic Act in 1914, it was estimated that there were from 150,000 to 200,000 narcotic addicts, mostly women, in the United States. By 1948, the number of addicts in the United States had been reduced to approximately 48,000, mostly men. The Geneva Convention of the League of Nations had also operated to reduce world-wide production and refining of opium and therefore addiction. Further progress in the control of production and distribution of narcotics under the ægis of the United Nations is to be expected.

Although legal control of narcotics represents an effective means of reducing addiction, these laws can hardly be regarded as completely just unless some provision is made for the addict who is the person chiefly affected by the passage of such laws. Since many addicts are not criminals, they should not be incarcerated in ordinary penal institutions merely because they are addicted. Special institutions which view addiction as a medical problem should be provided for the care of such persons. Addicts who are basically criminals should, however, not be treated in hospitals but should be sent to the usual penal institutions.

In the United States, the addict was at first neglected following enactment of the Harrison Narcotic Act and was sent to penal institutions along with criminals. The

realization that many of these people were actually sick individuals led to the establishment of two hospitals, one at Lexington, Kentucky, and the other at Fort Worth, Texas, which specialize in the care of narcotic addicts. The Lexington Hospital has been in operation since 1935 and the results obtained in treating addicts at this institution show that the effort has been well worthwhile. Of 11,041 addicts admitted between May 1, 1935 and January 1, 1949, 6,788 or 61.4 per cent have been admitted to the institution only once. Stated in another way, the known relapse rate is only 39.6 per cent. Although this rate indicates that the treatment of drug addiction is still far from completely satisfactory, it also shows that the treatment of drug addicts is far from the hopeless proposition which so many persons have thought it to be. Many addicts, who do relapse, remain abstinent for many years before returning to the use of drugs and such period of abstinence should be regarded as a considerable gain just as a long remission is counted a gain in other chronic relapsing diseases such as tuberculosis or arthritis.

The treatment of drug addicts also contributes to the prevention of addiction. Since addiction spreads from person to person like an infectious disease, isolation of the addict from susceptible individuals during his treatment prevents the spread of addiction. Cure of an addict, like cure of a tuberculous patient, removes an infectious focus.

Continuing improvement in the results of the treatment of drug addicts is dependent more upon advances in our knowledge of mental disease than it is upon any other factor. The intensification of research in this field gives us every reason to hope that new knowledge, which will lead to great improvement in the results of the treatment of addiction, will soon be uncovered.

BIBLIOGRAPHIC NOTES

1. TATUM, A. L., and SEEVERS, M. H.: "Theories of Drug addiction", *Psychological Review, 36:* 447-475, 1929.

2. REICHARD, J. D.: "Addiction: some theoretical considerations as to its nature, cause, prevention, and treatment", *American Journal of Psychiatry, 103:* 721-730, 1947.

3. VOGEL, V. H., ISBELL, H., and CHAPMAN, K. W.: "Present status of narcotic addiction: with particular reference to medical indications and comparative addiction liability of the newer and older analgesic drugs", *Journal of the American Medical Association 138:* 1019-1026, 1948.

4. KOLB, L.: "Drug addiction in its relation to crime", *Mental Hygiene, 9:* 74-89, 1925.

5. KOLB, L.: "Pleasure and deterioration from narcotic addiction", *Mental Hygiene, 9:* 699-724, 1925.

6. HIMMELSBACH, C. K., and SMALL, L. F.: "Clinical studies of drug addiction: II. 'Rossium' treatment of drug addiction, with a report on the chemistry of 'Rossium' ", *Public Health Reports Supplement, 125:* 1-18, 1927.

7. EDDY, N. B.: "Tolerance and addiction", chapter 10 in KREUGER, H., EDDY, N. B., and SUMWALT, M.: "The pharmacology of the opium alkaloids", part I. *Public Health Reports Supplement, 165:* 687-758, U.S. Government Printing Office, Washington, D.C., U.S.A., 1941.

8. HIMMELSBACH, C. K.: "With reference to physical dependence". *Federation Proceedings, 2:* 201-203, 1943.

9. WIKLER, A.: "Recent progress in research on the neurophysiologic basis of morphine addiction". *American Journal of Psychiatry, 105:* 329-338, 1948.

10. HIMMELSBACH, C. K.: "The morphine abstinence syndrome, its nature and treatment". *Annals of Internal Medicine, 15:* 829-839, 1941.

11. ISBELL, H.: "The newer analgesic drugs; their use and abuse". *Annals of Internal Medicine, 29:* 1003-1012, 1948.

12. ISBELL, H., WIKLER, A., EDDY, N. B., WILSON, J. L., and MORAN, C. L.: "Tolerance and addiction liability of 6-dimethylamino-4-4-diphenylheptanone-3 (methadon)", *Journal of the American Medical Association, 135:* 888-894, 1947.

13. TATUM, A. L., SEEVERS, M. H., and COLLINS, K. H.: "Morphine addiction and its physiological interpretation based on experimental evidence", *Journal of Pharmacology and Experimental Therapeutics, 36:* 447-475, 1929.

14. WIKLER, A., and FRANK, K.: "Hindlimb reflexes of chronic spinal dogs during cycles of addiction to morphine and methadon", *Journal of Pharmacology and Experimental Therapeutics, 4:* 382-400, 1948.

15. FELIX, R. H.: "An appraisal of the personality types of the addict", *American Journal of Psychiatry, 100:* 462-467, 1944.

16. VOGEL, V. H., and ISBELL, H.: "The addiction liability of methadon and its use in the treatment of the morphine abstinence syndrome", *American Journal of Psychiatry, 105:* 909-914, 1949.

OFFICIAL SECTION

Commission of Inquiry on the Coca Leaf

At the request of the Government of Peru, then of the Government of Bolivia, the United Nations sent, during the autumn of 1949, to these countries, a Commission of Inquiry to investigate the effects of chewing the coca leaf and the possibilities of limiting its production and controlling its distribution (see *Bulletin on Narcotics*, vol. I, no. 1, October 1949).

The Commission and its secretariat left New York on 10 September 1949 and returned on 4 December 1949. Its report was completed in May 1950: two parts of this report are hereby reproduced, namely, the methods of work of the Commission, and its conclusions and recommendations.

Methods of Work

Mindful of the instructions of the Economic and Social Council, and with a view to concluding its local inquiries as efficiently and speedily as possible, the Commission adopted the methods of work described below, both in Peru and in Bolivia.

Contacts with Central Authorities in Peru and Bolivia

Immediately on its arrival at Lima the Commission entered into official contact through the Ministry of Foreign Affairs with the central Peruvian authorities. After visiting the Minister of Foreign Affairs, the Minister of Public Health, the Minister of Justice and the Minister of the Interior, the Commission and its secretariat consulted on particular points of interest for its inquiries with the higher officials of the above-mentioned Ministries and of the Ministry of Finance and Agriculture. In addition to these consultations, the Commission applied to the competent authorities for statistical and other data more readily obtainable in the country's administrative centre.

In Bolivia the Commission, after establishing official contacts through the Ministry of Foreign Affairs with the Bolivian authorities, held consultations with the Minister of Foreign Affairs, the Under-Secretary of State for Foreign Affairs, the Minister of Finance, the Minister of Economic Affairs, the Minister of Public Education, the Minister of Agriculture and the Minister of Public Health. As in Peru, these consultations were followed by conferences with the higher officials of the above-mentioned Ministries, who were asked to furnish information material similar to that requested of the Peruvian authorities at Lima.

Appointment of Officials responsible for Liaison between the Governments concerned and the Commission

In order to facilitate its negotiations with both the central and the local authorities, the Commission requested the Governments of Peru and Bolivia each to appoint a government official as liaison officer for that purpose. The Government of Peru appointed Dr. Carlos Avalos, Chief of the Narcotics Department of the Ministry of Public Health and Social Welfare, representative of Peru to the United Nations Commission on Narcotic Drugs, member of the National Executive Council against Illicit Traffic in Narcotic Drugs and representative of the Ministry of Public Health on the State Coca Monopoly. The Government of Bolivia appointed Dr. Alfredo Quiroga, Director of the Nutrition Department of the Ministry of Public Health.

The appointment of liaison officers proved to be highly useful, and the Commission cannot too greatly emphasize how efficiently these officers co-operated with it.

Contacts with Local Civil Authorities

The Commission had requested the central authorities of Peru and Bolivia to take the necessary steps so that it might enter into relations with the authorities of the areas to be visited.

These measures having accordingly been taken, the Commission was able in the course of its movements to obtain the full co-operation of the prefects, deputy prefects, mayors, and municipal and police authorities. Similar facilities were extended to enable the Commission to approach the local authorities representing the Ministries chiefly concerned; in Peru, these included the representatives of the Ministry of Public Health and Social Welfare, the Ministry of Finance (and more particularly this Ministry's Deposit and Trust Fund), the Ministry of Agriculture and the Ministry of Education; and, in Bolivia, officials of the Ministry of Public Health, the Ministry of Labour and Social Welfare, the Ministry of Agriculture, the Ministry of Finance and the

Coca Excises, and the Ministry of Economic Affairs. In addition, the Commission made contact whenever necessary with officials not included in the above categories.

Contacts with the Military Authorities

Both in Peru and in Bolivia the military authorities lent their assistance to the Commission in its inquiries. The regional commandants and their staffs placed themselves at the Commission's disposal for any information required; the military medical officers in both countries deserve special mention.

Contacts with the Medical Profession, Pharmacists and Academic Circles

In all the localities visited by the Commission the members of its medical section, sometimes joined by one or two members of its economic and social section, held conversations with local medical practitioners. In university towns the Commission did not fail to use the good offices of faculty members. The talks with representatives of local pharmacists were frequently found useful.

Contacts with Employers and Workers

Whenever possible the Commission endeavoured to make contact with existing agricultural, industrial and other employers' or workers' organizations. Particular reference should be made to the contacts established with coca-leaf producers and, in Bolivia, the Society of Landowners of the Yungas area, and with representatives of the mining companies and of workers' trade unions both in Peru and Bolivia.

Contacts with Religious Authorities and Missionaries

In a number of localities the Commission interviewed representatives of the religious authorities and members of Catholic and Protestant missions.

Contacts with Representatives of Public Opinion interested in the Coca Leaf Problem

Anxious to obtain as comprehensive a picture as possible of the currents of public opinion on the coca-leaf problem, the Commission was eager to establish contact not only with the medical and scientific circles mentioned above, but also with the Press and all organizations or persons interested in this problem. A number of Press releases on the Commission's work were issued. Interviews were given to journalists. Conferences were held with engineers, agronomists, jurists, politicians and other persons interested in the problem.

National Commissions

The Governments of Peru and of Bolivia have each set up a National Coca Leaf Commission. It was part of the duty of these Commissions, which are responsible for studying the coca-leaf problem on a national scale, to co-operate with the United Nations Commission of Inquiry.

Both in Peru and Bolivia the United Nations Commission held a number of joint meetings with these National Commissions, which are composed of prominent persons, and furnished information highly valuable for the Commission's work. The membership of the two National Commissions is shown in annex IV of the present report.

Conferences

In each of the principal localities visited in the interior of Peru and of Bolivia, the Commission, in order to obtain most promptly the greatest possible variety of views on the coca-leaf problem, held conferences at which the local prefect, deputy prefect or mayor usually presided. These conferences were usually attended by the members of the Commission and its secretariat, the principal civil and military officials, representatives of the medical profession, of the civil, military and police authorities, the Civil Guard, producers, merchants, manufacturers, engineers, agronomists, journalists, workers and others. Conferences of this kind were held in Peru at Arequipa, Puno, three at Cuzco Quillabamba, Tingo María, Huánuco, Cerro de Pasco, Trujillo and Cajamarca; and in Bolivia, Acha-Cachi, Huarizata Coroico, Chulumani Cochabamba and Catavi.

At Huánuco, for example, the meeting was convened by the local prefect and mayor, who published a notice in the local *Official Gazette* inviting all persons interested in the problem to attend the conference. These conferences, the Commission believes, did a great deal to provide valuable information and enable the Commission to hear expressions of public opinion on the coca-leaf problem.

Documentation

The Commission endeavoured to assemble as much written information as possible on the coca-leaf problem, both by applying to central or local authorities, as mentioned above, for statistics and documents, and by asking the National Commissions, or organizations or private persons, to submit written reports on the question.

In addition to these written data, the Commission also made observations on the spot. It visited laboratories, hospitals, schools, missions, prisons, agricultural stations and farms, factories, mines, mining camps and co-operatives. In the course of its travels the Commission was able to observe living and housing conditions in widely separated regions. The Commission ascribes great importance to this part of its work, since it was able in this way to compare its field observations with the written data and the literature on the coca leaf.

INTERNATIONAL SYMPOSIUM ON ALTITUDE BIOLOGY

This congress was held under the auspices of the United Nations Educational, Scientific and Cultural Organization at Lima from 23 to 30 November 1949, and was attended by representatives of a number of countries who are specialists in the study of the biological problems connected with altitude. The experts of the Commission's medical section were invited to attend the meetings, and were thus enabled to obtain information, connected with its own terms of reference.

Conclusions and Recommendations

Under the resolution of the Economic and Social Council (159 (VII) IV, 10 August 1948, document E/968) the terms of reference of the Commission of Enquiry into the effects of chewing the coca leaf include the following two points:

A. Investigation of the effects of chewing the coca leaf in Peru and Bolivia, and;

B. Investigation of the possibilities of limiting the production and controlling the distribution of the coca leaf in the said countries.

Both questions have been dealt with in this report. On the basis of the investigation conducted in Peru and Bolivia, the Commission unanimously decided to submit the following conclusions and recommendations. Mr. Fonda dissenting only on the recommendation concerning "Gradual Limitation".

CONCLUSIONS

I. COCA CHEWING IS NOT AN ISOLATED PHENOMENON

The chewing of coca leaf must be considered not as an isolated phenomenon but as a consequence of the social and economic conditions under which large sections of the population of Peru and Bolivia are living. These conditions affect principally but not exclusively the indigenous agricultural and mining populations of the two countries. The great majority of chewers is to be found in those two population groups. Although the chewer is predominantly Indian, there are also chewers amongst the "mestizos". It is not always easy to draw a sharp distinction between the two; the living conditions of certain sectors of the mestizo population being very similar to those of the population regarded as Indian.

II. DANGER OF CHEWING

The leaves of the coca plant contain cocaine. In the present state of knowledge the indications are that the effects produced by chewing coca leaf are to be explained by the action of cocaine.

III. NATURE OF CHEWING

It does not at present appear that the chewing of the coca leaf can be regarded as a drug addiction in the medical sense.

The Expert Committee on Drugs liable to Produce Addiction gave the following definition of addiction at its meeting of 9 to 14 January 1950 (WHO Technical Report Serial No. 21, 1950):

"6. 1 Definition of drug addiction:

"Having considered the request of the Commission on Narcotic Drugs, the committee drafted the following definition of 'drug addiction':

"Drug addiction is a state of periodic or chronic intoxication detrimental to the individual and to society, produced by the repeated consumption of a drug (natural or synthetic). Its characteristics include:

"(1) An overpowering desire or need (compulsion) to continue taking the drug and to obtain it by any means;

"(2) A tendency to increase the dose;

"(3) A psychic (psychological) and sometimes a physical dependence on the effects of the drug."

Compared with this, the observations of the Commission show that coca chewing is not an addiction (toxicomania) but a habit. It may, however, in some individuals, become an addiction, but generally it can be given up like other habits.

IV. HARMFUL EFFECTS OF CHEWING

Briefly the harmful effects of chewing coca leaf, from the point of view of the individual and of the nation, are the following:

(*a*) It inhibits the sensation of hunger and thus maintains, by a vicious circle, a constant state of malnutrition;

(*b*) It induces in the individual undesirable changes of an intellectual and moral character. This is especially clear in exceptional cases, and it is much discussed how far this is general. It certainly hinders the chewer's chances of obtaining a higher social standard;

(*c*) It reduces the economic yield of productive work, and therefore maintains a low economic standard of life.

V. NUTRITIVE VALUE OF COCA LEAVES

Coca leaves contain, as do other green leaves, vegetables and fruits, most of the known vitamins, especially B_1, B_2 and C in significant quantities. In spite of this fact it would by no means be advisable to supply these vitamins in the form of coca leaf chewing i.e., together with the toxic substance cocaine. In no way can the chewing of coca leaves therefore be regarded as a substitute for an adequate diet.

VI. Acclimatization of the Andean Man

The Andean man is highly acclimatized to the life at great altitudes. All our knowledge up to the present time supports the conviction that it is unnecessary to regard the Andean Indian as a race for which special physiological laws must be assumed. We have no right to suppose that cocaine acts differently on him. No advantage of coca chewing for acclimatization and for continuous life at high altitudes has been shown scientifically, and persons of non-Andean origin have become acclimatized in large numbers to life in the high altitudes of the Andes without chewing coca leaf.

VII. Solution of the Problem

Since chewing coca is not an isolated fact, but the consequence of a number of unfavourable social and economic factors, the solution of the problem involves two fundamental and parallel aspects: firstly, the need for improving the living conditions of the population amongst which chewing is a general habit, and secondly, the need for initiating simultaneously a governmental policy to limit the production of coca leaf, to control its distribution and eradicate the practice of chewing it.

VIII. Gradual Suppression of Chewing

The chewing of coca leaf is a habit which can be eradicated if the conditions under which it originated are suitably modified.

In view of the social and economic nature of the factors determining coca chewing, an immediate and radical suppression of the habit is not possible. Instead of solving the problem, such a suppression would only aggravate the existing situation. Consequently the Commission envisages only a gradual suppression of the habit, that is, a process which, while taking into account the complexity of the problem, should not be so long as to permit the harmful continuation of the habit nor so short as to damage the economic interests involved.

RECOMMENDATIONS

On the basis of the above conclusions, two groups of recommendations are formulated. The first comprises recommendations relating generally to the existing social and economic factors which give rise to coca leaf chewing. By their very nature these recommendations are here formulated in a general way.

The second group of recommendations is related to the possibility of limiting the production of coca leaf, of controlling its distribution and finally of gradually eradicating the practice of chewing. In accordance with the terms of reference as defined by the Economic and Social Council, these recommendations are given in detail.

A. Recommendations concerning the factors chiefly responsible for the chewing of coca leaf

Before formulating these recommendations, the Commission desires to point out that the Governments of Peru and Bolivia have made, and are at present making, certain efforts to improve the living conditions of the respective populations amongst which the bulk of the chewers are to be found. But the vastness of the problem and the great complexity and cost of the measures necessary to solve it have not permitted these Governments to obtain the results which they would doubtless desire to achieve.[1] Consequently the Commission formulates the following recommendations:

I. Nutrition

The primary need is to improve the nutritional status of that part of the population which is affected by the chewing of coca leaf. One of the basic observations of this Commission was that where the food is good and sufficient, chewing stops. This observation is in agreement with many medical and military opinions in these countries. Of all the factors concerned, better nutrition abolishes most quickly the habit of chewing. Specific and detailed reference has been made in this respect to the malnutrition existing in the coca leaf producing and chewing areas. Reference has also been made to the studies carried out both by national and international commissions and organizations.

The bettering of nutrition as recommended above implies the application of a co-ordinated plan which would take a certain amount of time and effort on the part of the Governments of Peru and Bolivia. The technical assistance of the United Nations seems possible, especially of its specialized agencies whose own objectives bring them into contact with these problems. Among these agencies special mention should be made of the United Nations Food and Agriculture Organization which had already made a report in 1949 on the "Agriculture of the Altiplano", and which has referred to the food situation of these countries at its Montevideo Conference of July 1948. The World Health Organization is equally interested in nutrition as a basis of good health which results in greater productivity and higher social standard. The International Labour Office called attention, in 1943 and 1946, to under-nutrition. From an educational point of view, the United Nations Educational, Scientific and Cultural Organization is interested also. All these organizations have dealt in some measure in their own sphere with the problem of under-nutrition in these populations.

In any case the studies already made provide a more

[1] Reference has repeatedly been made in the present report to the efforts which the above-mentioned Governments, acting either on their own account or in collaboration with some other Government, have made to improve certain aspects of the living conditions of the population in general by the establishment of special bodies.

than sufficient basis for the adoption of a policy designed to produce an immediate improvement in the nutrition of the population affected by the habit of coca chewing. This population comprises not only the chewers but their families and all those who live in the coca leaf producing and chewing areas.

The Commission is of the opinion that the *keynote of the whole* action against chewing coca leaf can and must be the bettering of nutrition.

II. Other Recommendations

(*a*) *Hygiene*

Sanitary and hygienic conditions should be improved in the regions affected.

(*b*) *Housing*

The improvement of housing conditions both in rural areas and in the mining districts is also essential. Here education in what housing is and means should form an integral part of the policy to be adopted.

(*c*) *Education*

This should be understood in a general sense and also in a special sense. The first involves an improvement in general education and the speedier possible elimination of illiteracy. Between the latter and coca leaf chewing, there is a clear connexion. The Commission has been able to observe that where education increases, there is a parallel decrease in chewing.

The second aspect relates to education in agricultural, hygiene and health matters already mentioned in the preceding recommendations. An improved agricultural education is essential in order to secure:

(1) A general improvement in the peasant's living conditions;

(2) An improvement in production and thus in the diet of the people.

(*d*) *Labour*

The existing labour conditions, particularly in the rural districts, should be improved. An essential condition of such an improvement is the institution of a legal system of land tenure (*arrendamiento*) which would gradually replace the existing system, since the latter cannot be regarded as suited to present agricultural requirements.

The new system should also institute more equitable relations between landlord and tenant. The latter should be given greater legal security than he now has.

The form of sub-tenancy, particularly those of the so-called *allegados* in Peru, should be carefully studied with a view to finding, if possible, a contractual form more in harmony with modern legal, social and economic requirements.

As has been said, Act No. 10.885, in Peru, is now being revised, and there is a plan of agrarian reform in Bolivia. It is to be hoped that both plans will result in an improvement in the legal conditions of labour considered in this report.

(*e*) *Extension of agricultural credit*

This is to some extent now being practised in both Peru and Bolivia, mainly through the activities of the respective Agricultural Banks.

The present system is generally based on individual loans secured by a specific guarantee. Though recognizing the importance of the work done by the abovementioned banks, the Commission is of the opinion that greater attention should be paid to the problem of establishing and maintaining producers' and consumers' co-operatives. The individual loan, though useful, is always of limited economic and social effect, particularly in view of the conditions in which the small farmer now lives. In such conditions, he cannot always offer the guarantees necessary to obtain a loan.

The problem of establishment and maintenance of co-operatives presents evident difficulties, but they are not insuperable. An adequate policy would enable a start to be made with them in the immediate future. The spirit of co-operation existing in the present Indian communities could be enlisted to assist in the organization of these co-operatives.

(*f*) *Transport*

The carrying out of the preceding recommendations would be greatly facilitated by a general improvement and further development of transport, mainly roads and railroads.

The implementation of the above recommendations implies the application of a vast and co-ordinated plan which would take a certain amount of time and effort on the part of the Governments of Peru and Bolivia with the technical assistance of the United Nations and of its specialized agencies whose own objectives bring them into contact with the problems here described.

B. Recommendations relating to the possibility of limiting the production of the coca leaf and controlling its distribution and the gradual suppression of chewing

In formulating these recommendations, the principles previously laid down have been borne in mind.

Although the limitation of the production of coca leaf and the control of its distribution necessarily entail limitation of consumption, it has been considered advisable to arrange the following recommendations in two groups. Such a distinction should be understood not as

a division but as an arrangement of two closely complementary groups of recommendations.

1. *Recommendations Relating to the Limitation of Production and the Control of Distribution*

I. Simultaneous Limitation of Production in Peru and Bolivia

A policy for the limitation of the production of coca leaf and the control of its distribution should be adopted simultaneously by Peru and Bolivia. The respective legislative provisions should be based on the same principles and pursue identical purposes. In implementing a policy of limitation, these legislative measures should take into account the national characteristics which the coca leaf problem presents in each of the two countries concerned.

II. Purposes of the Limitation

In applying measures for limiting the production of the coca leaf, account should be taken of the purposes for which the leaf is used namely:

(*a*) The satisfaction of world medical and scientific requirements and of other requirements in accordance with the existing International Conventions on Narcotics;

(*b*) Chewing.

The purposes mentioned necessitate a limitation of production governed by both national and international provisions. The production of the quantities necessary to satisfy (*a*) and (*b*), should be subject to the estimates established internationally by the competent organ.[2]

III. Gradual Limitation

Limitation of the production of coca leaf for the purpose mentioned in (*b*) above should be effected gradually until complete suppression is achieved within a period of fifteen years or any shorter period which the Governments concerned may consider practicable.

For that purpose the Governments concerned should take the necessary steps to secure an annual reduction by one-fifteenth of the production of coca leaf at present used for chewing or by such larger proportion of the said production as the Governments concerned may consider practicable.

The Governments concerned shall forward to the Secretary-General of the United Nations an annual report on the progress of the gradual suppression of the production of coca leaf and its chewing.

As a minority opinion, Mr. H. B. Fonda considers that the gradual suppression should take place within a period of five years. The reasons are that with the implementation by the Governments concerned of the other conclusions and recommendations on which he concurs the above period of five years is a practicable one. Therefore, a complete suppression of the habit of chewing can be achieved in the maximum of five years.

IV. System of Control

To ensure the success of the limitation of production in accordance with purposes (*a*) and (*b*) (see recommendation II), it is necessary:

(*a*) That a cadastral survey of the cultivation of the coca leaf should be carried out as soon as possible in Peru and Bolivia;[3]

(*b*) That taking into account the above-mentioned economic and regional characteristics and the quality of the coca leaf, etc., the respective Governments should decide which coca leaf producing areas will satisfy within the period during which gradual suppression is to be effected, the requirements indicated in recommendation II;

Any other cultivation of the coca leaf, outside the scope of the purposes and limitations referred to, should be considered illicit and subject to the appropriate legal penalties;

(*c*) That the respective Governments should establish a system for the registration of

(i) Existing producers, and

(ii) Existing dealers (wholesale and retail) in coca leaf;[3]

Once the registration of the above is complete, no other person should be authorized to produce coca leaf or trade in it in any way;

Authorizations to trade in coca leaf should be understood as granted on a personal basis and should lapse as soon as the person authorized ceases for any reason to deal in coca leaf;

(*d*) That a system to control the actual production and distribution of coca leaf should be established;[3]

(*e*) That an official organ or an organ under official supervision should be set up and entrusted with the task of applying the control measures to all operations affecting the coca leaf. Such an organ should also be the only one authorized to export coca leaf, for whatever purpose it is intended.[3]

(*f*) No authorization should be granted for any other coca plantation beyond those already in existence.

V. Crop Substitution

The substitution of other crops for the cultivation of the coca leaf should be encouraged as far as possible by the Governments concerned. Among other measures,

[2] See document F.N.7/AC.3/3.

[3] The Government of Peru has already begun to implement this recommendation.

a preferential system might be established for providing agricultural, economic and technical aid to any grower of coca leaf who wishes to replace it by some other crop.

As a complement of such a policy, it would be advisable to establish that in principle no agricultural loan will be granted for the production of coca leaf. As a consequence of a practice established by the respective Agricultural Banks, no loans for the cultivation of coca leaf are at present granted by those banks either in Peru or in Bolivia. The object of the present recommendation is to convert this practice, which is still not altogether universal, into a legal provision.

It would be desirable that in making agricultural loans preference should be given to those growers who do not produce coca leaf and who undertake not to grow it.[3]

Consideration might also profitably be given to the possibility of providing that the rate of interest on any loan granted to a farmer who also grows coca leaf, be higher than that on loans granted to farmers who do not grow coca leaf.

VI. Sanctions

Promulgation and application of legal provisions establishing adequate administrative and penal sanctions against those who violate the provisions relating to the limitation of production and the control of distribution of the coca leaf.

2. *Recommendations Relating to the Gradual Suppression of the Practice of Chewing Coca Leaf*

VII. Legal Prohibition of Chewing in the Army

The practice now adopted by the armies of Peru and Bolivia of not permitting the chewing of the coca leaf during military service should be elevated to the status of a legal prohibition.

VIII. Educational Propaganda

Appropriate legislation should render compulsory the provision in every centre of education or place of work of adequate information regarding the harmful effects of chewing coca leaf.

Such legislation should be supplemented by such other propaganda measures as the Governments of Peru and Bolivia may consider it advisable to introduce, particularly amongst the Indian agricultural and mining population.

IX. Legal Prohibitions

It should be legally prohibited on pain of appropriate penalties:

(*a*) To pay for work or any kind of loan or service directly or indirectly, wholly or partly, with coca leaf;

(*b*) To infringe the provisions regarding the gradual reduction in the daily supply of coca leaf to the workers;

(*c*) To infringe any of the legal provisions intended to secure the gradual suppression of the practice of chewing coca leaf.

X. Regulation of Prices

Official regulation of the price of coca leaf intended for chewing during the period of gradual suppression, in order to avoid excessive prices which might endanger the adequate satisfaction of requirements relating to food, housing, clothing, hygiene and health.

XI. Appeal to the Government of Argentina

In view of the existence, in the north of the Argentine Republic, of a large group of chewers who, though largely not of Argentine nationality, consume annually a considerable quantity of coca leaf, it would be desirable that the Government of that country should be invited to collaborate to the extent it may deem necessary in the gradual suppression of the coca leaf in that area.

XII. International Co-ordination of Policies

The complete success in one country of a policy of the gradual suppression of the habit of chewing coca leaves, of the corresponding limitation of the production of these leaves, and the control of their distribution will depend in a very large measure on identical policies being pursued and carried out in other countries where this habit exists.

To further the adoption of such policies by all countries concerned and facilitate the co-ordination of the measures resulting therefrom, it might be advisable to convene, under the auspices of the United Nations, a meeting of these countries with a view to reaching an agreement on the questions referred to above, pending the adoption of the new single convention on narcotic drugs.

In submitting these recommendations and thus concluding the present report, the Commission is aware that they represent no more than the basic steps to be taken to secure limitation of the production of the coca leaf, control of its distribution and the gradual reduction of chewing.

The implementation of the recommendations with all the complementary aspects which that implies is a task which falls exclusively within the competence of the Governments concerned.

[3] See note [3] on preceding page.

New Legislation on the Coca Leaf

1. Peru

LEGISLATIVE DECREE NO. 11046 (ESTABLISHING THE COCA MONOPOLY)

The President of the Military Committee (*Junta Militar*) of Government *Whereas*

The Military Committee (Junta Militar) of Government has adopted the following legislative decree:

The Military Committee (Junta Militar) of Government, Considering:

That Peru is a signatory to international conventions for limiting the consumption of narcotic drugs;

That it is therefore essential to establish provisions to enforce compliance with the said conventions;

That moreover it is the duty of the State, in the interest of human welfare and for compelling national reasons, to consider the problem of coca-leaf chewing in Peru with a view to limiting immediately and, later, eradicating this very general custom in the interests of the native population;

That it is also the duty of the State to protect the national heritage, represented by investments in the cultivation of this valuable plant, the use of which for scientific purposes is of great benefit to humanity;

In the exercise of the powers vested in it

Hereby decrees as follows:

Article 1. The Coca Monopoly is hereby established in the territory of the Republic.

Article 2. The Monopoly shall control the sowing, cultivation, harvesting, distribution, consumption and export of coca. In conformity with the Supreme Decree of 8 June 1948 the Ministry of Public Health and Social Welfare shall remain responsible for the industrialization of coca for medical purposes.

Article 3. The Ministry of Finance shall, by special decree, designate the areas of the national territory in which the coca leaf may be cultivated; and shall establish the time-limits within which stocks of coca suitable for consumption must be declared, for the purpose of the acquisition of these stocks by the Monopoly at prices to be fixed by the said Ministry.

Article 4. The Tax Collection Department of the *Caja de Depósitos y Consignaciones* shall be responsible for the administration of the Coca Monopoly.

Article 5. The Ministry of Finance is authorized to make the relevant regulations, which shall cover the following matters: (*a*) the establishment of a single price for coca, which shall include all the local and State taxes at present in force; (*b*) the apportionment of the revenue obtained from this source among the various bodies which benefit from these taxes; (*c*) the preparation of a cadastral survey of the plantations in the producing areas; (*d*) the penalties applicable for infringements of this Decree and its regulations; (*e*) the estimate of the expenses required for the operation of the Monopoly.

Article 6. The revenue obtained from the operation of the Monopoly shall be employed principally for the building of barracks for the army.

Given at Government House, Lima, 13 June 1949.
[*Signatures follow*]

COCA MONOPOLY—SUPREME DECREE [REGULATIONS]

Whereas it is necessary to make regulations for the application of Legislative Decree No. 11046 concerning the Coca Monopoly,

Now therefore the President of the Military Committee (Junta Militar) of Government hereby decrees as follows:

The Coca Monopoly established by Legislative Decree No. 11046 shall be governed by the following regulations:

1. The following shall be the only areas in which the cultivation of coca is authorized in the Republic: In the Department of Apurimac: San Jerónimo and Huascatay. In the Department of Ancash: Cabana. In the Department of Amazonas: Chachapoyas, Tingo, Tocabamba, Izuquia, Colcamar, Ocumal, Ocai, Cogón,

La Ramada, San Rafael and San Lucas. In the Department of Ayacucho: Ayna, Huanta, Sillacocha, Vizcatán, Cabildopampa, Cuchicancha, Chungui, Magdalena, Sachapunco, and Sacharacay. In the Department of Cuzco: Calca, Pucartambo, Pumacocha, Tinac, Lirihuyoc, Urubamba, Quillabamba, Chaullay, Ocollopani, Macupicchu and Quelleouna. In the Department of Cajamarca: Bolivar, Cajabamba, Cascas, Celendín, San Marcos. In the Department of Huánuco: La Parroquia, El Valle, Acomayo, Huacrachuco, La Esperanza, Santo Domingo, Monzón, Aguellín, Tazo Grande, Tazo Chico, Chipaquillo, Garita, Maravillas, Panao and Tingo María. In the Department of Junín: Andamarca, Satipo, La Merced, Huancabamba, Oxapampa. In the Department of La Libertad: Pedregal, Otuzco, Huamachuco, Tayabamba, Chiclín. In the Department of Puno: Limbani, Macusani, Amascusani, Patambuco Sandia. In the Department of San Martín: Uchiza.

When circumstances justify it and subject to a report from the Monopoly, the Ministry of Finance may, by resolution, authorize the cultivation of coca in other areas.

2. Individuals or bodies corporate that engage in the cultivation of or trade in coca must register with and comply with the formalities prescribed by the Monopoly; if they fail to do so they may not lawfully continue their activities. The time-limit for this registration shall be sixty days from the date of this Decree.

3. The individuals or bodies corporate that engage in the cultivation of coca shall be required to keep books in which shall be entered all particulars relating to the crops, harvest, production and sale, suitably classified; the said books shall be supplied by the Monopoly at cost. New crops may not be sown nor existing ones extended or renewed and unsuccessful plantations may not be destroyed unless notice, supported by a statement of the reasons, is first given to the Monopoly so that the change may be recorded in the registers.

4. The Monopoly shall in due course prepare a cadastral survey of the plantations in the production areas and shall carry out and lay before the Ministry of Finance the related technical studies so that the said Ministry may appoint the date on which the Monopoly system shall be put into full operation; pending such appointment coca leaf allocated for consumption shall be liable to a single tax of forty centavos per kilogramme, with the exception of that produced in the Department of Cuzco which shall be taxable at the rate of sixty centavos per kilogramme.

5. The rates prescribed in the preceding article shall be inclusive of all the State and local charges to which coca was hitherto liable in the Republic; the Monopoly shall submit to the Ministry of Finance, for its approval, the system of compensation to be applied to enable the former beneficiaries of the revenue from the local taxes hereby abolished, to continue to receive the income due to them, on the basis of the average tax yield for the years 1947-1948.

6. The foregoing article, in abolishing the charges therein referred to, shall also operate to abolish the local excise taxes (including the municipal wine tax) instituted by the provisions to which the said article relates, even if such taxes do not expressly apply to coca.

7. The Monopoly shall take steps to recover from the stocks at present delivered for consumption the amount whereby the revenue collected under the rates prescribed in article 4 of this Decree is lower than the revenue which would have been produced by the said stocks under the system hitherto in force.

8. The tax shall be deemed to be due as from the time when the coca is ready to be released for consumption; for this purpose the Monopoly shall make periodical inventories of the coca at the producing centres, the owners or carriers being responsible for any discrepancies which are found to exist and for which no satisfactory explanation is given.

9. Coca may not be transported from production to consumption centres save by public highway and during official working hours; it must in all cases be covered by a certificate of payment, a transfer sheet, a free transit sheet or a certificate of payment of tax, in the form to be prescribed by the Monopoly.

10. Stocks delivered to warehouses for consumption must be covered by the respective certificates of payment, on which any sales made shall then be noted, these sales in their turn being covered either by a free transit sheet or an invoice, according to whether the amount sold is intended for local purposes or for dispatch elsewhere.

11. The said warehouses shall keep a ledger in which they shall enter their operations in the form prescribed by the Monopoly.

12. Establishments engaged in the sale of coca must display at their entrances a special doorplate, to be supplied at cost by the Monopoly, indicating whether they are warehouses or wholesale or retail establishments.

13. As from the date of this Decree the Monopoly shall alone be authorized to export coca produced in the country, subject to prior approval by the Ministry of Finance. Export contracts concluded by private parties before 31 May 1949 will be recognized and authorized by the Monopoly, provided that the parties concerned, within fifteen days from the date of this Decree, submit to the Monopoly the documents attesting the legality of the transaction.

14. Any individual or body corporate that contravenes the provisions governing the operation of the Coca Monopoly shall be liable to the following penalties:

(*a*) Seizure of all crops grown without the prior permission of the Monopoly;

(*b*) Seizure of coca transported by non-authorized routes or at night or unaccompanied by the requisite documents;

(*c*) Seizure of coca found in warehouses or commercial establishments without the certificate of payment of tax or respective sheet;

(*d*) For transporting the coca without paying the tax due, payment of three times the amount of the tax;

(*e*) A fine varying from 100 to 5,000 sols according to the sum due and the value of the transaction, in all cases not expressly provided for.

15. Special magistrates appointed to deal with seizures shall be responsible for the application of the penalties set forth in the preceding article; to the extent to which they are applicable, the provisions of the regulations concerning alcoholic beverages, including those relating to the proportion payable to informers whose information leads to the apprehension of the offender, shall apply.

16. The Monopoly is empowered to prescribe such control measures as it deems necessary for the better execution of Legislative Decree No. 11046 and of the present Regulations.

Given at Government House, Lima, 2 August 1949.

[*Signature follows*]

SUPREME DECREE [ON EXPORTS]

Whereas by Legislative Decree No. 11046 of 13 June 1949 the Coca Monopoly was instituted in the territory of the Republic, the relevant regulations having been enacted by Supreme Decree of 2 August 1949 issued by the Ministry of Finance and Commerce;

And whereas the export of coca leaf is subject to an international control system which requires the application of a system of official import certificates and export authorizations, to be issued by the competent authorities responsible, in pursuance of the relevant conventions, for issuing the said certificates and authorizations which are recognized by the international bodies;

And whereas the Ministry of Public Health and Social Welfare (Department of Narcotics), in pursuance of the above-mentioned conventions, is the authority responsible for furnishing to the organs of international control diverse statistical information relating to the production, consumption, export, stocks, etc., of coca leaf;

And whereas the Coca Monopoly should co-operate with the said Ministry to ensure that the said statistical information is supplied in the most exact and complete form;

Now therefore the President of the Military Committee (Junta Militar) of Government

Hereby decrees as follows:

1. The export of coca leaf shall continue to be subject to the system of international control of narcotic drugs; and accordingly coca leaf shall be exported through the Coca Monopoly, subject to official export certificates first had and obtained from the Ministry of Public Health and Social Welfare (Department of Narcotics), which shall issue them on production of the official import certificates issued by the competent authorities of the importing countries.

2. It is the duty of the Coca Monopoly to supply the Ministry of Public Health and Social Welfare with detailed reports concerning the cultivation, harvest, production, consumption and stocks of coca leaf.

3. The head of the Department of Narcotics, in his capacity as the Peruvian representative on the United Nations Commission on Narcotic Drugs, is appointed to represent the Ministry of Public Health and Social Welfare in its dealings with the Tax Collection Department of the *Caja de Depósitos y Consignaciones* on matters concerning coca and the Coca Monopoly.

Given at Government House, Lima, 25 August 1949.

[*Signatures follow*]

MINISTRY OF JUSTICE AND LABOUR

PERUVIAN COCA LEAF COMMISSION

SUPREME RESOLUTION NO. 122

Whereas it is desirable to co-ordinate all research undertaken in Peru into the problem of coca, and to establish for that purpose a body of scientists which will also, when the occasion arises, co-operate with the Commission appointed for similar purposes by the United Nations; and

These purposes being approved;

It is hereby resolved as follows:

To appoint a Commission under the chairmanship of Dr. Carlos Monge, having as its members Dr. Fortunato Carranza, Mr. Alberto Leon (engineer), Mr. Juvenal Monge (engineer), Dr. Enrique Encinas, Dr. Alberto Gusmán Barrón, Dr. Humberto Aste, Dr. Manuel Sánchez Palacios and Dr. Jorge Castañeda, which Commission shall be responsible for:

(*a*) Conducting a general study of the problem of coca in Peru;

(*b*) Co-operating with the Commission appointed by the United Nations to undertake such studies in countries where the problem exists;

(*c*) Co-ordinating its activities with those of foreign agencies established for the same purpose.

The Commission may invite opinions from Peruvian or foreign scientists who have studied this problem, and shall be authorized to obtain from the Departments of Public Administration any technical, statistical or other data necessary for the satisfactory performance of its duties.

Lima, 7 September 1949

At a subsequent date (14 December 1949) Mr. Carlos Avalos, Head of the Narcotics Department (Ministry of Public Health), and Mr. Andrés Lindow, Administrator of the Coca Monopoly, were also appointed to the Commission.

2. Bolivia

BOLIVIAN COCA LEAF COMMISSION

Presidency of the Republic

Whereas:

The United Nations Commission of Enquiry into the biological effects of the chewing of the coca leaf is shortly to be set up in Bolivia and will require the co-operation of the Bolivian scientists and persons who have carried out research into this subject; and

Whereas:

The success of the said Commission is of national interest and accordingly the Government should organize a body of collaborators to give guidance and assistance in its work;

Hereby decrees as follows:

Article 1. A National Coca Leaf Commission is hereby set up to co-operate with the United Nations Commission in inquiries into the effects of the chewing of the coca leaf and shall be composed as follows: Chairman of the Commission, Dr. Alfredo Quiroga C., Director of the National Department of Nutrition; Members: Dr. Raimundo Manriquez, Head of the Bromatological Laboratory of the Ministry of Health; Ing. Raúl Pérez Alcalá, representative of the Ministry of Agriculture; Ing. Guillermo Guevara, representative of the *Corporación Boliviana de Fomento;* Dr. Martín Cárdenas, botanist, Professor of the San Simón University at Cochabamba; and Messrs. Juan Granier Chirveches, Abel Solíz S., José Crespo Gutiérrez, Jorge Cusicanqui and Alfonso Zalles V., Professor of the School of Biochemistry and Pharmacy of the San Andrés University at La Paz.[1]

Article 2. The principal duties of the Commission shall be:

(*a*) To make a full study of the coca leaf and of the coca-leaf problem in Bolivia.

(*b*) To co-operate with the Commission appointed by the United Nations.

(*c*) To co-ordinate agreements with similar bodies in other countries.

For these purposes it may request Bolivian or foreign scientists, who have carried out studies of the coca leaf and its effects, to co-operate and provide information, and may also apply to the fiscal departments for any technical, statistical or other data required for the successful performance of its duties.

Article 3. The expenses incurred in the organization and operation of the said Commission shall be defrayed by the Coca Leaf Customs Administration and shall be charged under the heading of Administrative Expenses for so long as the Commission is exercising its functions.

The Minister for Foreign Affairs and Public Worship, the Minister of Agriculture, the Minister of Stock-breeding and Commerce, the Minister of Hygiene and Public Health and the Minister of Finance and National Economy shall be responsible for giving effect to the present Decree.

[*Signatures follow*]

3. Argentina

ARGENTINIAN COCA LEAF COMMISSION

Ministry of Public Health

ORDER NO. 23,134, 25 FEBRUARY 1950

Whereas:

Coca-leaf chewing, a habit which has been established for centuries in our country, still constitutes a problem for the health of the Argentine nation, affecting a large section of the population in the north;

The harmfulness of this habit has been proven, even though some of its effects still remain open to question;

This knowledge, and the experience gained since the former National Health Department intervened in the matter, indicate the advisability of studying the matter further, by carrying out some investigations new to this country;

Although the intervention of the National Ministry of Public Health to date has succeeded in putting an end to the previous absence of control over the trade in this commodity and restricting annual imports of it to a predetermined quantity, the problem can only be solved through an *ad hoc* body grouping together all the officials required to make an exhaustive study of the matter and assuming the functions of special adviser on the subject;

It would unquestionably be useful to establish such a special commission and entrust it with the functions necessary for co-operation with other national or pro-

[1] The following were appointed subsequently: Dr. Remberto Capriles; D. Luis Solis; Dr. Serapio Mandueño and Dr. Rodolfo López-Kruger.

vincial bodies, in particular the health authorities of the northern provinces of Argentina which are directly affected by the problem of coca-leaf chewing, since subsequent to the promulgation of Legislative Decree, No. 31,208/45, Act 12,912, situations have arisen which have had to be settled according to the circumstances, although not in strict conformity with the spirit of the Act;

Furthermore, Order No. 20,507 of 19 October 1949 issued by this Ministry provides for the consideration of necessary amendments to the current system;

Now therefore, the National Minister for Public Health hereby orders:

Article 1. A Technical Coca Commission is established, for the purposes set forth in the preamble to the present Order.

Article 2. The Technical Coca Commission shall be composed of the following officials of the National Ministry of Public Health: Chairman, the Technical Director of Social Psychopathology; members, the Director of the Health Code and Legislation, the Director of Food, the Director of Pharmacy and the Pharmaceutical Industry and the Chief of the Narcotics Control Section.

Article 3. The Technical Coca Commission shall have the following functions:

(*a*) To carry out the necessary studies to obtain exhaustive information on the biological and toxicological effects of habitual consumption of the drug;

(*b*) To promote the reform of current legislation on the traffic in and use of the drug, with a view to elaborating and proposing a plan for the progressive total elimination of coca-leaf chewing;

(*c*) To agree upon the quantity of coca to be imported into the country annually and its distribution between those importers who were registered as at the date of Order No. 20,507/49 issued by the National Ministry of Public Health.

Article 4. In order to carry out its work the Technical Coca Commission shall establish contact with such provincial and municipal health authorities as it deems fit, and shall be empowered to deal directly with them and to detail members of the Commission to those parts of the country where coca-leaf chewing is most prevalent; it shall also be empowered to contact other similar national or international commissions and likewise to solicit such special advice as it deems necessary, from any organs of this Ministry.

Article 5. The Technical Coca Commission shall, within ninety days, draw up the draft legislation designed to replace that at present in force.

Article 6. For registration, communication by the Directorate-General of the Ministry, publication in the *Daily Bulletin* and inclusion in the archives.

ORDER NO. 23,559, 20 MARCH 1950

In view of the reasons stated by the Director of the Health Code and Legislation, and

Whereas:

The said reasons are legitimate and under the proposed modification acceptable, the National Minister for Public Health in the normal discharge of his functions, hereby decrees:

Article 1. That provision of Order No. 23,134/1950 which establishes that the Director of the Health Code and Legislation shall be a member of the Technical Coca Commission created by the said Order, is hereby cancelled.

Article 2. The Commission referred to in the preceding article is empowered to solicit the services of the Directorate of the Health Code and Legislation, in an advisory capacity, when it deems necessary.

Article 3. For registration: for publication by the Directorate-General of the Ministry in the *Daily Bulletin*; for communication to those whom it may concern; and thereupon for inclusion in the archives.

[*Signature follows*]

ERRATUM

In vol. II, no. 3, on page 34, under "Fifth Session of the Commission on Narcotic Drugs", the last paragraph but two should read: "It should be noted that new legislation relating to the coca leaf was recently introduced in Argentina, Bolivia and Peru and will be reproduced in the next issue of the *Bulletin*".

Bibliography

SYNTHETIC COMPOUNDS HAVING CANNABIS-LIKE ACTIVITY

NOTE

This Bibliography includes the chemical work on the natural components of Cannabis resin which led directly to syntheses of the same or similar compounds; also some work in which a synthetic compound was used as a standard for comparison.

A

ADAMS, Roger: Marihuana, *Science*, New York, 1940, 92, pages 115-119.

ADAMS, Roger: Marihuana, Harvey Lecture, 19 February 1942, *Bulletin of the New York Academy of Medicine*, 1942, 18, pages 705-730. Reprinted, *Harvey Lectures*, Lancaster, U.S.A., 1941-42, Series 38, pages 168-197.

ADAMS, Roger; PEASE, D. C.; CLARK, J. H.: Isolation of Cannabinol, Cannabidiol and Quebrachitol from Red Oil of Minnesota Wild Hemp, *The Journal of the American Chemical Society*, Easton, U.S.A., 1940, 62, pages 2194-2196.

ADAMS, Roger; BAKER, B. R.; CAIN, C. K.; CLARK, B. R.; WEARN, R. B.; WOLFF, H.: Conversion of Cannabidiol to a Product with Marihuana Activity. A Type Reaction for Synthesis of Analogous Substances. Conversion of Cannabidiol to Cannabinol, *The Journal of the American Chemical Society*, Easton, U.S.A., 1940, 62, pages 2245-2246.

ADAMS, Roger; BAKER, B. R.; CLARK, J. H.; PEASE, D. C.: Structure of Cannabinol. I. Preparation of an Isomer, 3-Hydroxy-l-n-amyl-6, 6, 9-trimethyl-6-dibenzopyran, *The Journal of the American Chemical Society*, Easton, U.S.A., 1940, 62, pages 2197-2200.

ADAMS, Roger; BAKER, B. R.; CAIN, C. K.: Structure of Cannabinol. II. Synthesis of Two New Isomers, 3-Hydroxy-4 *n*-amyl and 3-Hydroxy-2-*n*-amyl 6, 6, 9-Trimethyl-6-dibenzopyrans, *The Journal of the American Chemical Society*, Easton, U.S.A., 1940, 62, pages 2201-2204.

ADAMS, Roger; BAKER, B. R.; WEARN, R. B.: Structure of Cannabinol. III. Synthesis of Cannabinol, 1-Hydroxy-3-*n*-amyl-6, 6, 9-trimetbyl-6-dibenzopyran, *The Journal of the American Chemical Society*, Easton, U.S.A., 1940, 62, pages 2204-2207.

ADAMS, Roger; BAKER, B. R.: Structure of Cannabinol. IV. Synthesis of Two Additional Isomers Containing a Resorcinol Residue. *The Journal of the American Chemical Society*, Easton, U.S.A., 1940, 62, pages 2208-2215.

ADAMS, Roger; BAKER, B. R.: Structure of Cannabinol. V. A Second Method of Synthesis of Cannabinol, *The Journal of the American Chemical Society*, Easton, U.S.A., 1940, 62, page 2401.

ADAMS, Roger; HUNT, M.; CLARK, J. H.: Structure of cannabidiol, a product isolated from the marihuana extract of Minnesota wild hemp, *The Journal of the American Chemical Society*, Easton, U.S.A., 1940, 62, pages 196-200.

ADAMS, Roger; CAIN, C. K.; WOLFF, H.: Structure of Cannabidiol. II. Absorption Spectra Compared with those of Various Dihydric Phenols, *The Journal of the American Chemical Society*, Easton, U.S.A., 1940, 62, pages 732-734.

ADAMS, Roger; CLARK, J. H.; HUNT, M.; Structure of Cannabidiol. III. Reduction and Cleavage, *The Journal of the American Chemical Society*, Easton, U.S.A., 1940, 62, pages 735-737.

ADAMS, Roger; CAIN, C. K.; CLARK, J. H.; WOLFF, H.: Structure of Cannabidiol. IV. The Position of the Linkage between the Two Rings, *The Journal of the American Chemical Society*, Easton, U.S.A., 1940, 62, pages 1770-1775.

ADAMS, Roger; CAIN, C. K.; CLARK, J. H.; WOLFF, H.: Structure of Cannabidiol. V. Position of the Alicyclic Double Bonds, *The Journal of the American Chemical Society*, Easton, U.S.A., 1940, 62, pages 2215-2219.

ADAMS, Roger; CAIN, C. K.; CLARK, J. H.; PEASE, D. C.: Structure of Cannabidiol. VI. Isomerization of Cannabidiol to Tetrahydrocannabinol, a Physiologically Active Product. Conversion of Cannabidiol to Cannabinol, *The Journal of the American Chemical Society*, Easton, U.S.A., 1940, 62, pages 2402-2405.

ADAMS, Roger; BAKER, B. R.: Structure of Cannabidiol. VII. A Method of Synthesis of a Tetrahydrocannabinol which possesses Marihuana Activity, *The Journal of the American Chemical Society*, Easton, U.S.A., 1940, 62, pages 2405-2408.

ADAMS, Roger; BAKER, R. B.; CAIN, C. K.; PEASE, D. C.; LOEWE, S.; WEARN, R. B.; WOLFF, H.: Structure of Cannabidiol. VIII. Position of the Double Bonds in Cannabidiol. Marihuana Activity of Tetrahydrocannabinols, *The Journal of the American Chemical Society*, Easton, U.S.A., 1940, 62, pages 2566-2567.

ADAMS, Roger; JELINEK, C.; LOEWE, S.; WOLFF, H.: Tetrahydrocannabinol Homologs with Marihuana Activity. IX, *The Journal of the American Chemical Society*, Easton, U.S.A., 1941, 63, pages 1971-1973.

ADAMS, Roger; LOEWE, S.; SMITH, C. M.: Tetrahydrocannabinol Homologs and Analogs with Marihuana Activity. X., *The Journal of the American Chemical Society*, Easton, U.S.A., 1941, 63, pages 1973-1976.

ADAMS, Roger; CAIN, C. K.; LOEWE, S.: Tetrahydrocannabinol Analogs with Marihuana Activity. XI. *The Journal of the American Chemical Society*, Easton, U.S.A., 1941, 63, pages 1977-1978.

ADAMS, Roger; CAIN, C. K.; McPHEE, W. D.; WEARN, R. B.: Structure of Cannabidiol. XII. Isomerization to Tetrahydrocannabinols, *The Journal of the American Chemical Society*, Easton, U.S.A., 1941, 63, pages 2209-2213.

ADAMS, Roger; LOEWE, S.; McPHEE, W. D.; SMITH, C. M.: Tetrahydrocannabinol Homologs and Analogs with Marihuana Activity. XIII. *The Journal of the American Chemical Society*, Easton, U.S.A., 1942, 64, pages 694-697.

ADAMS, Roger; LOEWE, S.; SMITH, C. M.: Optically Active Synthetic Tetrahydrocannabinols; *d* and λ-l-Hydroxy-3-*n*-amyl-6, 9, 9-trimethyl-7, 8, 9, 10-tetrahydro-6-dibenzopyrans. XIV. *The Journal of the American Chemical Society,* Easton, U.S.A., 1942, 64, pages 2087-2089.

ADAMS, Roger; LOEWE, S.; SMITH, C. M.; THEOBALD, C.W.: Tetrahydrocannabinol Analogs with Marihuana Activity. XV. *The Journal of the American Chemical Society,* Easton, U.S.A., 1942, 64, pages 2653-2657.

ADAMS, Roger; CHEN, K. H.; LOEWE, S.: Tetrahydrocannabinol Homologs with a *s*-Alkyl Group in the 3-Position. XVI. *The Journal of the American Chemical Society,* Easton, U.S.A., 1945, 67, pages 1534-1537.

ADAMS, Roger; AYCOCK, F., Jr.; LOEWE, S.: Tetrahydrocannabinol Homologs, XVII., *The Journal of the American Chemical Society,* Easton, U.S.A., 1948, 70, pages 662-664.

ADAMS, Roger; HARFENIST, Morton; LOEWE, S.: New analogs of tetrahydrocannabinol. XIX. *The Journal of the American Chemical Society,* Easton, U.S.A., 1949, 71, pages 1624-1628.

ADAMS, Roger: *Pharmacologically Useful Products from Cannabidiol,* British Patent 558,418, January 5, 1944.

ADAMS, Roger: *Dibezopyran Derivatives Having Marihuana Activity,* British Patent 564,827, October 16, 1944.

ADAMS, Roger: *Polyalkylated 5-hydroxy-1, 2-benzopyrans,* U.S. Patent 2,354,492, July 25, 1944.

ADAMS, Roger: *Tetrahydrodibenzopyrans,* U.S. Patent 2,419,934, 6 May 1947.

ADAMS, Roger: *Tetrahydrodibenzopyrones and tetrahydrodibenzopyrans,* U.S. Patent, 2,419,935, 6 May 1947.

ADAMS, Roger: *Tetrahydrocannabinol,* U.S. Patent 2,419,936, 6 May 1947.

ADAMS, Roger: *Hexahydrocannabinol and Homologs,* U.S. Patent 2,419,937, 6 May 1947.

ALDRICH, C. Knight: The Effects of a Synthetic Marihuana-like Compound on Musical Talent as Measured by the Seashore Test, *Public Health Reports,* Washington, 1944, 59, pages 431-433.

ALLES, Gordon A.; ICKE, Roland, N.; FEIGEN, George A.: Some Analogs of Synthetic Tetrahydrocannabinol, *The Journal of the American Chemical Society,* Easton, U.S.A., 1942, 64, pages 2031-2035.

ALLENTUCK, Samuel; BOWMAN, Karl M.: The Psychiatric Aspects of Marihuana Intoxication, *American Journal of Psychiatry,* Baltimore, 1942, 99, pages 248-251.

B

BEMBRY, T. H.; POWELL, G.: Compounds of the Cannabinol Type. I. Synthesis of some Compounds Related to Tetrahydrocannabinol, *The Jonrnal of the American Chemical Society,* Easton, U.S.A., 1941, 63, pages 2766-2768.

BLATT, A. H.: A critical survey of the literature dealing with the chemical constituents of *Cannabis sativa, Journal of the Washington Academy of Sciences,* Washington, 1938, 28, pages 465-477.

BERGEL, F.; MACDONALD, A. D.; MORRISON, A. L.; RINDERKNECHT, H.; TODD, A. R.; WOOLFE, G.: *Cannabis Indica,* Part XII., Some Analogues and a Water-Soluble Derivative of Tetrahydrocannabinol, *Journal of the Chemical Society,* London, 1943, pages 286-287.

BOSE, B. C.; MUCKERJI, B.: The Physiologically Active Fractions of Indian Hemp, *Cannabis sativa, Indian Journal of Medical Research,* Calcutta, 1945, pages 265-270.

C

CAHN, R. S.: *Cannabis indica* resin, Part II. *Journal of the Chemical Society,* London, 1931, pages 630-638.

CAHN, R. S.: *Cannabis indica* resin, Part III, The Constitution of Cannabinol, *Journal of the Chemical Society,* London, 1932, pages 1342-1353.

CAHN, R. S.: *Cannabis indica* resin, Part IV, The synthesis of some 2:2 dimethyldibenzopyrous, and confirmation of the structure of cannabinol, *Journal of the Chemical Society,* London, 1933, pages 1400-1405.

D

DAVIS, Jean P.; RAMSEY, H. H.: Anti-epileptic action of Marihuana-active substances, *Federation Proceedings,* 1949, 8, pages 284-285.

DUNSTAN, W. R.; HENRY, T. A.: On Oxycannabin from Indian Hemp, *Proceedings of the Chemical Society,* London, 1898, 14, pages 44-45.

E

EASTERFIELD, T. H., WOOD, T. B.: The constituents of Indian hemp resin, *Proceedings of the Cambridge Philosophical Society,* Cambridge, 1897, 9, pages 144-148.

G

GHOSH, R.; PASCALL, D. C. S.; TODD, A. R.: *Cannabis indica,* Part III., The synthesis of dibenzopyran derivatives including an isomer of cannabinol. *Journal of the Chemical Society,* London, 1940, pages 118-121.

GHOSH, R.; TODD, A. R.; WILKINSON, S.: *Cannabis indica,* Part IV., The Synthesis of some Tetrahydrodibenzopyran Derivatives, *Journal of the Chemical Society,* London, 1940, pages 1121-1125.

GHOSH, R.; TODD, A. R.; WILKINSON, S.: *Cannabis indica,* Part V., Synthesis of cannabinol, *Journal of the Chemical Society,* London, 1940, pages 1393-1396.

GHOSH, R.; TODD, A R.; WRIGHT, D. C.: *Cannabis Indica,* Part VI., The Condensation of Pulegone with Alkyl Resorcinals. A New Synthesis of Cannabinol and of a Product with Hashish Activity, *Journal of the Chemical Society,* London, 1941, pages 137-140.

H

HIMMELSBACH, C. K.: Treatment of the Morphine Abstinence Syndrome with a Synthetic Cannabis-like Compound, *Southern Medical Journal,* Birmingham, 1944, 37, pages 26-29.

J

JACOB, A.; TODD, A. R.: Cannabidiol and cannabol, constituents of *Cannabis indica* resin, *Nature,* London, New York, 1940, 145, page 350.

JACOB, A.; TODD, A. R.: *Cannabis indica,* Part II, Isolation of cannabidiol from Egyptian hashish. Observations on the structure of cannabinol, *Journal of the Chemical Society,* London, 1940, pages 649-653.

L

LEAF, G.; TODD, A. R.; WILKINSON, S.: *Cannabis Indica,* Part IX. The Isolation of 3':4':5':6'-Tetrahydrodibenzopyran Derivatives from Pulegone-Orcinol and Pulegone-Olivetol Condensation Products. Synthesis of d-Tetrahydrocannabinol, *Journal of the Chemical Society,* London, 1942, pages 185-188.

LEVINE, Joseph: Origin of Cannabinol, *The Journal of the American Chemical Society,* Easton, U.S.A., 1944, 66, pages 1868-1870.

LOEWE, S.: Toxicity of Marihuana-active Principles, *Federation Proceedings,* Baltimore, 1945, 5, No. 1, pages 127-128.

LOEWE, S.: Bioassay by direct potency estimation, *Science,* New York, 1947, 106, pages 89-91.

LOEWE, S.: Studies on the Pharmacology and acute toxicity of compounds with marihuana activity, *Journal of Pharmacology and Experimental Therapeutics,* Baltimore, 1946, 88, pages 154-161.

LOEWE, S.: The Chemical basis of marihuana activity, *Journal of Pharmacology and Experimental Therapeutics,* Baltimore, 1945, 84, pages 78-81.

LOEWE, S.: The Rate of Disappearance of a Marihuana-active Substance from the Circulating Blood, *Journal of Pharmacology and Experimental Therapeutics,* Baltimore, 1946, 6, pages 294-296.

LOEWE, S.; ADAMS, Roger: Structure activity relationship (SAR) and pharmacological peculiarities of new synthetic congeners of tetrahydrocannabinol, *Federation Proceedings,* Baltimore, 1947, 6, page 352.

LOEWE, S.; GOODMAN, Louis S.: Anticonvulsant action of marihuana-active substances, *Federation Proceedings,* Baltimore, 1947, 6, 352.

M

MAYOR'S COMMITTEE ON MARIHUANA; George B. WALLACE, Chairman: *The Marihuana Problem in the City of New York: Sociological, Medical, Psychological, and Pharmacological Studies,* Lancaster, Pennsylvania; Jacques Cattell Press, 1944.

P

POWELL, G.; BEMBRY, T. H.: Synthesis of Cannabinol, *Journal of the American Chemical Society,* Easton, U.S.A., 1940, 62, page 2568.

POWELL, G.; BEMBRY, T. H.; SALMON, M.; WALTON, L. S.: The active principle of marihuana, *Science,* New York, 1941, 93, pages 522-523.

R

ROCHE PRODUCTS LTD. (TODD, A., R., GHOSH, R.): *Polynydrobidenzopyran derivatives,* British Patent 547669, 7 September 1942.

ROCHE PRODUCTS LTD. (TODD, R.; WILKINSON, S., GHOSH, R.): *Tetrahydrodibenzopyran derivatives,* British Patent 543363, 23 February 1942.

RUSSELL, P. B.; TODD, A. R.; MACDONALD, A. D.; WILKINSON, S.; WOOLFE, G.: *Cannabis Indica,* Part VII., The Relation between Chemical Constitution and Hashish Activity, *Journal of the Chemical Society,* London, 1941, page 169.

RUSSELL, P. B.; TODD, A. R.; MACDONALD, A. D.; WILKINSON, S.; WOOLFE, G.: *Cannabis Indica,* Part VIII, Futher Analogues of Tetrahydrocannabinol, *Journal of the Chemical Society,* London, 1941, pages 826-829.

S

STOCKINGS, G. T.: A new Euphoriant for Depressive Mental States, *British Medical Journal,* London, 1947, I., pages 918-922.

T

TODD, A. R.: Chemistry of the Hemp Drugs, *Nature,* London, New York, 146, pages 829-830.

TODD, A. R.: The Chemistry of Hashish, *The Scientific Journal of the Royal College of Science,* London, 1942, 12, pages 37-45.

TODD, A. R.: The Hemp Drugs, *Endeavour,* London, 1943, 2, pages 69-72.

TODD, A. R.: Hashish, *Experientia,* Basle, Switzerland, 1946, II/2, pages 55-60.

W

WILLIAMS, E. G.; HIMMELSBACH, C. K.; LLOYD, Bolivar J., Jr.; RUBLE, Dorothy C.; WIKLER, A.: Studies on marihuana and pyrahexyl compound, *Public Health Reports,* Washington, 1946, 61, pages 1059-1083.

WOLFF, P. O.: Dolor y Euforia. Adelantos farmacológicos, *Ciencia e Investigación,* Buenos Ayres, 1948, pages 186-198.

WOLLNER, H. J.; MATCHETT, J. R.; LEVINE, J.; LOEWE, J.: Isolation of a physiologically active tetrahydrocannabinol from *cannabis sativa* resin, *Journal of the American Chemical Society,* Easton, U.S.A., 1942, 64, pages 26-29.

WOOD, T. B.; SPIVEY, W. T. N.; EASTERFIELD, T. H.: Charas, the Resin of Indian Hemp, *Journal of the Chemical Society, Transactions,* 1896, London, 69, pages 539-546.

WOOD, T. B.; SPIVEY, W. T. N.; EASTERFIELD, T. H.: Cannabinol, *Proceedings of the Chemical Society,* Cambridge, 1898, 14, pages 66-67, 153-154.

WOOD, T. B.; SPIVEY, W. T. N.; EASTERFIELD, T. H.: Cannabinol, Part I., *Journal of the Chemical Society, Transactions,* London, 1899, 75, pages 20-36.

WORK, T. S.; BERGEL, F.; TODD, A.: The active principles of *Cannabis indica* resin. I., *Biochemical Journal,* London, 1939, 33, pages 123-127.